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Original Contributions.

ARTICLE XIII.

THE RELATIVE DANGERS OF ANÆSTHESIA BY CHLOROFORM AND ETHER—STATISTICS OF 209,893 CASES.

BY E. ANDREWS, A.M., M.D., Prof. of Principles and Practice of Surgery, in Chicago Medical College.

The determination of the actual rates of danger in the use of our principal anæsthetics is a desideratum long felt by surgeons, but one which, owing to the difficulties of the undertaking, has generally been despaired of. M.M. Perrin and Lallemand, of France, in their elaborate work upon anæsthesia, pronounce the accomplishment of the task impossible. They remark, that to obtain the result, it would be necessary to "compare the number of the fatal cases with the approximate number of etherizations, so as to deduce the proportion of deaths. That last term of the comparison is wanting, and we hesitate not to say will always be wanting." (*Traite d'Anesthesie*, pp. 235, 236.)

Other surgeons seem to have been equally hopeless of success in this matter, so that our best works on anæsthesia are often perfectly silent, on the important point of the relative dangers of the different articles. Yet this is the very thing on which the surgeon most needs light, at the present time. It is well

known that chloroform is by far the most convenient article for use, and, therefore, always to be preferred, if equally safe; but if it is materially more dangerous than ether. the conscientious surgeon will choose the latter, for the sake of the safety of his patient. This is, therefore, a question of tremendous magnitude, possibly involving thousands of lives in its decision, hence the surgical profession will not quietly acquiesce in the opinion that its solution is impossible.

A three years' investigation has shown that this apparent impossibility may be overcome, and that although mathematical precision may be unattainable, yet a statistical approximation, sufficient for all practical purposes, may be established. Although we can ascertain neither the whole number of anæsthesias which have taken place in the world, nor the whole number of resulting deaths, yet we can obtain from hospitals and private records numerous masses of statistics, each of which gives a great number of anæsthesias, and the exact number of deaths pertaining to it; and by adding many such masses together, we can obtain cases enough to establish the ratio of danger. My figures thus obtained give us 92,815 cases of anæsthesia by ether, and 117,078 by chloroform, with the resulting deaths from each.

Up to the present time, the attempts to determine the ratio of danger have been as follows:—In 1859, Dr. John Chapman, of England, made a rough estimate, that chloroform had been given in all the hospitals of the world about 1,200,000 times; at the same time he gathered from books and journals 74 recorded deaths. He assumed that this represented the entire number killed by the anæsthetic, and that, consequently, the mortality was one to 16,000 anæsthesias. (*Westminster Review*, January, 1859.) The error of the calculation, of course, consists in assuming that all the deaths are published. Physicians, resident in Paris, inform me, that only about half of the known deaths from anæsthesia appear in print, in that city, while in England and in this country, probably not one-fifth part are ever published. As a general rule, a surgeon who has killed a patient by chloroform does not feel in a mood for publishing it;

hence the whole calculation is worthless, and the idea of the imposing authority of a quarterly review, being lent to the support of such an absurdity, is certainly amusing.

Dr. F. Sabarth, of Wurtemburg, published in French a work which was deemed worthy of translation into German. He estimates that all the anæsthesias in the world, during fourteen years, had amounted to 3,000,000; and finding 119 published cases of deaths, he reckons the mortality as about one in 26,000. It is obvious that this calculation is vitiated by the same blunder of supposing that all the deaths are published.

After the Crimean war, Baudens stated, that there were in that campaign 30,000 chloroformizations, in the French army, without a single death. (*Rev. de deux Mondes*, April, 1857.) Were these figures reliable, they would be a valuable addition to our statistics; but they are under suspicion. In the first place, the round number, 30,000, looks very like a vague estimate, rather than a statistical footing; secondly, a total absence of deaths in 30,000 chloroformed cases is contrary to the experience of all the rest of the world; and, finally, other French surgeons, present in the army, are said to affirm, that they personally knew deaths to occur from chloroform, which were not put on record as such. In the English Crimean army, one chloroform death, at least, is known; but the official reports give us no clue to the number of administrations of the article.

Dr. Richardson, of England, has, perhaps, given more attention to this matter than any European writer. He is quoted by Sansom, as having estimated in the *Medical History of England*, that the ratio of deaths from chloroform is about one in 17,000; but I infer that this is either a misprint, or else Dr. Richardson has since changed his opinion; for he has informed me that he now estimates the mortality about ten times higher than that, *i.e.*, one in 1500. Yet, Sansom's statement is still the basis of opinion for most of the London surgeons, on this subject.

In respect to the dangers of ether, the only information I find is the report of a committee of the Society of Medical Improvement, of Boston, which gives the opinion that no death

has ever been known from that agent, while the surgeons of Lyons, in France, who use ether exclusively, and believe it to be much the safest article, yet admit that it occasionally kills in their hands.

The facts collected in the following pages will, I hope, enable us to draw correct conclusions on this subject. The information was mainly obtained by personally visiting the principal hospitals of the world; but it is supplemented by correspondence with spots not visited, as well as by information from other sources, such as reports of the Surgeon-General of the U. S. Army, private records, etc.

In obtaining these facts, my method of procedure was, take from the records of each hospital (where reliable records existed), the number of anæsthesias and the number of resulting deaths. Reports of deaths, not accompanied with the number of anæsthesias, and reports of anæsthesias, not stating the number of deaths, are rigidly rejected. Where reliable records did not exist, I obtained, by personal consultation with the House Surgeons, a careful statement of the annual number of anæsthesias, based on the known average frequency per week, and carried this estimate over any period, during which the same officers could certify positively as to the number of deaths. All these cases are surgical; the results of anæsthesia, as used in midwifery, not coming within the scope of my inquiry.

In deciding what deaths were really caused by the anæsthetics, I have generally followed the opinion of the officers reporting them; but where this could not be obtained, I have adopted the principle, that for a death to be fairly attributed to the anæsthetic, it must be immediate, or nearly so, and there must be no other probable cause present. These rules exclude a great number of deaths, vaguely reported as due to chloroform and ether. Thus, out of 21 reported to the Surgeon-General of the U. S. Army, as caused by chloroform, only seven were found fairly attributable to that agent. It is not possible to keep absolutely clear of all errors, on this point, but I think I have obtained a close approximation to the truth; and as I have pursued exactly the same course with ether as with chloroform,

the errors, if any exist, must be fairly distributed on both sides of the question, and the results of the comparison of the two anæsthetics cannot vary much from mathematical verity. The following tables will show the results of the inquiry:—

TABLE OF CHLOROFORMIZATIONS, WITH THE ACCOMPANYING DEATHS.

SOURCES OF INFORMATION.	CHLOROFORMIZATIONS.	DEATHS.
Chicago (Hospital and private records),	6,726	5
Bellevue Hospital, N. Y. (about 1867–8),	600	1
Charity " "	1,460	2
Private practice of a Surgeon in Phila., about	1,000	0
U. S. Army Records (Circular No. 6),	13,956	7
Royal Infirmary, Liverpool,	2,000	2
Workhouse Hospital, "	1,800	0
Southern " "	2,000	1
Northern " "	950	0
Charing Cross " London,	800	1
Middlesex " "	600	0
Royal Ophthalmic Hospital, London,	2,808	1
Guy's Hospital (Eye Department), "	3,224	0
" " (Surg. Department)"	11,500	3
*University Hospital, "	18,250	4
Dreadnaught " "	1,400	1
London " "	13,000	3
St. George's " "	8,000	2
Westminster " "	3,120	1
St. Thomas' " "	3,746	2
Other London Hospitals,	9,826	3
La Pitie, Paris,	312	2
K. K. Allg. Kraukenhaus, Vienna,	10,000	2
Totals,	117,078	43
Ratio of Mortality,		1 to 2723

SULPHURIC ETHER.

In investigating the dangers of ether we are met by contradictory assertions, among those who use it most extensively. A committee of the Boston Society of Medical Improvement, headed by Dr. R. M. Hodges, made a report in 1861, maintaining that no death had yet been correctly attributed to ether. On the other hand, the surgeons of Lyons, in France, who use

*Mr. Erichsen stated, that there were only two deaths, but the House Surgeon informed me that there had positively been four. As Mr. Erichson may have forgotten, or never known of, deaths occurring in the service of the other surgeons, I have adopted the statement of the House Surgeon.

ether exclusively, claim that it occasions a few deaths. I have succeeded in collecting nearly 93,000 cases of anæsthesia, by ether, and among them were found deaths which seem as fairly attributable to that article, as similar cases are to chloroform; though there is a bare possibility of error, of course, in either anæsthetic. Following the rule above indicated, I count, for the present purpose, only the deaths occurring among the 93,000 cases reported to me, and make no assertions *pro* or *con*, about deaths reported outside of that list.

In the New York Hospital, the officers report two deaths from ether, one of which, I reject as not fairly coming within that designation. The rejected case was admitted March, 1864, for a stab in the neck which had penetrated the carotid artery. A large effusion of blood into the tissues occurred, making a tumor which pushed the trachea an inch to the other side, and so pressed upon the nerves as to occasion great pain. Hemorrhage repeated itself about every half hour, till the next day, and was checked each time by pressure of the fingers. The tumor continued to enlarge and press more severely, and the next day it was resolved to make an effort to secure the artery by ligature. The patient was etherized, when the respiration became embarrassed. A second attempt was followed by the same result, and, in a few moments, by death. I conclude, that in this case, the pressure of the tumor on the respiratory nerves was such as to partially paralyze them, requiring the mental attention of the patient to keep up the respiration; and the compression of the trachea might add to the trouble. As soon therefore as the volition was withdrawn by anæsthesia, the respiratory efforts would be embarrassed, and the result become fatal. In fact, the patient might be called already moribund, since the exhaustion of voluntary respiration would bring about the same result in a few hours. In these circumstances, the administration of a full opiate, or any other method of withdrawing the mental attention from the respiratory process, would have a like effect. It may, in a certain sense, be true, that the death occurred a little sooner, on account of the ether; but this is not what we mean by death from the toxic influence

of the anæsthetic. I should, without hesitation, reject such a case from the list of deaths by chloroform, and do the same by ether.

The other case was admitted September, 1865, for cancer under the canthus of the eye, which also seemed to occupy the cavities of the maxilla. The patient was etherized, and the operation commenced, everything appearing favorable. No great amount of blood was lost, but, early in the operation, respiration ceased, and the patient died, in spite of all efforts at resuscitation. There was no autopsy. Of course, it is possible that some other cause of death may have been present, but it is not probable that the patient would chance to die at that exact period, from disease, without the ether. Had such a death occurred under chloroform, I should, without hesitation, attribute it to the anæsthetic; and I coincide, therefore, with the officers of the hospital, in calling it a death from ether.

In the hospitals of Lyons, in France, five deaths have been spoken of as caused by ether. These have been carefully discussed by Dr. Gayet, Surgeon-in-Chief of the Hotel Dieu Hospital, of that city.

The first case was in 1852, at the Hotel Dieu, and was precisely like the one in New York Hospital, being a cancer of the superior maxilla. The patient was pale, thin, and cachectic. She was carefully and successfully etherized; but in the early stages of the operation, before the bone was touched, she ceased to breathe, and died, apparently of syncope. It should be mentioned, that the operation was in the sitting posture, a most dangerous position. But little blood was lost, however; and I incline to attribute the syncope to the anæsthetic, and, therefore, rank it as a death from ether.

The second case occurred at the hospital called l'Antiquaille, and was that of a woman etherized, for the removal of vegetations from the vulva. After a time, the pulse was found very feeble, and the operation was abandoned. Efforts to restore her failed, and she died. The surgeon of the hospital considered it a case of death by ether. The autopsy disclosed no cause of death.

The third case was of a man whose leg was crushed off by a locomotive. There were contusions of the abdomen and chest, and great hemorrhage. The shock was great, and the patient already speechless. He was etherized, and the thigh amputated, the patient dying during the operation. This is plainly a death from shock and hemorrhage, and not to be classed with the accidents from anæsthetics.

The fourth case was almost an exact repetition of the third. The patient had a terrible injury of the inferior extremity, with four violent hemorrhages, from a railroad accident. His thigh was amputated, under ether, and he died in less than an hour afterwards. This is evidently a death from shock and hemorrhage.

The last case was of a woman, whose autopsy showed tubercles in the spinal column and in both hip-joints; the cavities of the articulations being filled with cheesy matter, mingled with the debris of the bones. There was also a small tumor in the pia mater of the cerebrum. She was etherized, and the flexed thighs straightened with some force. The adductor muscles, on both sides, were torn, and the neck of one femur broken, by the operation. There was also considerable blood effused. The patient showed signs of syncope, but, by the prompt use of restoratives, recovered her pulse and color, and was carried to her bed by the attendants. Arriving at the bed, she fainted a second time; and the nurses not understanding what to do, she was past recovery before the surgeon was called. There is more doubt about this case than about either of the others; but after considering the terrible condition, both of the brain, the spine, and the hip-joints, and the natural results of extensive laceration of muscles, effusion of blood, and fracture of the neck of the femur on such an exhausted constitution, it appears to me that the ether was not chargeable with the death. I coincide with the officers of the hospital, therefore, in the opinion that the patient succumbed to simple syncope, caused by the operation, and rendered fatal by the accidental absence of skilled assistance, on its second recurrence. Two other cases of death have been spoken of, in the vicinity of Lyons, as

caused by ether; but not being in the hospitals, they do not come within the scope of my statistics.

Finally, one case of death by ether is reported to me verbally, by the officers of St. Thomas' Hospital, London. I could not learn the particulars.

We have, therefore, four deaths, apparently caused by ether, in circumstances where we can make a comparison with the total number of cases of anæsthesia, among which they occurred. The following table gives a view of the results:—

TABLE OF ETHERIZATIONS WITH THE ACCOMPANYING DEATHS.

SOURCES OF INFORMATION.	ETHERIZATIONS	DEATHS.
Chicago Records,	895	0
Mass. General Hospital, Boston, about	25,000	0
City Hospital, " "	8,760	0
New York Hospital, New York,	5,100	1
Bellevue " " (about 1868–69),	600	0
Pennsylvania " Philadelphia,	2,500	0
Episcopal " "	3,432	0
Private Practice, "	250	0
U. S. Army (Circular No. 6.),	6,978	0
St. Thomas' Hospital, London, about	1,000	1
LaPitie " Paris, about	300	0
Hospitals of Lyons, about	38,000	2
Totals,	92,815	4
Ratio of Mortality,	1 to 23,204	

It is evident, therefore, that the ratio of mortality, in surgical anæsthesia, by chloroform, is about eight and a-half times greater than by ether.

Sufficient statistics upon the subject of mixtures of chloroform and ether have not been collected to form a sure basis of opinion. The following table, so far as it goes, seems to show that the ratio of danger is, as might be expected, between the other two:—

TABLE OF ANÆSTHESIAS, BY MIXTURES OF CHLOROFORM AND ETHER, WITH THE ACCOMPANYING DEATHS.

Sources of Information.	Anæsthesias.	Deaths.
Chicago Statistics, about	350	1
U. S. Army (Circular No. 6),	2,326	0
Guy's Hospital, London	8,500	1
Totals,	11,176	2
Ratio of Mortality,		1 to 5588

From this it would seem that the mixtures have proved twice as safe as chloroform, and about four times more dangerous than ether.

With regard to the new anæsthetic, bichloride of methylene, we have as yet no decisive results, but the English journals report a single death among about 7000 cases.

Nitrous oxide, contrary to our first impressions, turns out to be the safest of all anæsthetics. It is not easy to place the result in figures; but in cities where we constantly have deaths from chloroform, we seldom hear of any by the gas. The only statistics which I know of on the subject are those kept by the Colton Dental Association. This is an associated circle of dental establishments, with branches in all the largest cities, which confine themselves exclusively to the extraction of teeth, and invariably use the gas as an anæsthetic, and preserve a record of each case. The plan of this record was prepared by Dr. Colton, at the suggestion of a member of Congress. I have no means of positively verifying its accuracy, but, yet, I attribute considerable value to it. The Association, at the present time, claims to have anæsthetized about 75,000 patients, in the United States, without any death.

Finally, if we summarize the whole matter, it seems that the various anæsthetics have the following rates of mortality:—

Sul. Ether,	1 death to	23,204	administrations.
Chloroform,	1 " "	2,723	"
Mixed Chloroform and Ether,	1 " "	5,588	"
Bichloride of Methylene,	1 " "	7,000	"
Nitrous Oxide,	No death in	75,000	"

ARTICLE XIV.

REMARKS ON RELATIONS OF THE PHYSICAL FORCES TO DISEASE.

By F. HOMER BLACKMAN.

Etiology is the most difficult of all branches of medical study to elucidate. In this department of medical science, more than in any other, speculations and theories have occupied the place of facts. "All scientific inquiry begins in the same manner with guesses;" various conjectures and hypothesis being made to explain observed phenomena. Men are not all equally skilled in making generalizations. It depends mainly on boldness of thought and fertility of invention, an original cast of intellect, an inquisitive and suggestive frame of mind, which sees and prizes that which others neglect, which abides by no rules, and is a law unto itself. The celebrated chemist, Faraday, has said: "the world little knows how many thoughts and theories, which have passed through the mind of a scientific investigator, have been crushed in silence and secrecy by his own adverse criticism." All theories and generalizations are of use in scientific investigations, and have, in many instances, been productive of great good. It is probable that much of the discrepancy of opinions existing concerning the action of drugs, and our want of faith in medication, in general, is due to different observers holding dissimilar theories, by which they interpret the various phenomena of physiology and pathology. What seems to be wanting in medical science, more than anything else, is a central idea of life. We will never be able to rightly apprehend disease until we are able, in lucid terms, to state what life is. Life has hitherto been looked upon as a resultant of ordinary chemical forces, of the inorganic world, modified by a peculiar force called vital. In the advancing light of modern science, this vital force has flown, leaving no trace behind of its existence; and in its place there comes a "physical basis of life," plainly suggesting that there is some

one kind of matter which is common to all living beings, and that their endless diversities are bound together by a physical as well as an ideal unity; showing conclusively that there is a "community of faculty between the bright-colored lichen, which so nearly resembles a mere mineral incrustation of the bare rock on which it grows, and the painter, to whom it is instinct with beauty, or the botanist, whom it feeds with knowledge."

The difference in faculty, in all living organisms is in degree, and not in kind. Contractility is manifest under the influence of certain stimuli, as well in the lowest plant as in the highest animal. There is a well-founded hope that presently we shall have a theory of life, which shall not have its origin in the idle vagaries of the imagination, but in substantial phenomena, which we are capable of appreciating and understanding. Scientific research has pretty fully demonstrated, that a threefold unity exists common in all life, namely: "A union of power or faculty, a unity of form, and a unity of substantial composition." The essential constituents of the "physical basis of life" is carbonic dioxide, water, and ammonia.

Modern science asserts of this matter of life, that it is composed of ordinary matter, "differing only in the manner in which its atoms are aggregated." Under whatever disguise it takes refuge—whether in the fungus, or oak, worm, or man—the living protoplasm not only ultimately dies and is resolved into its mineral and lifeless constituents, but is always dying; and, strange as the paradox may seem, could not live unless it died. In fact, in living organisms more than elsewhere, we see exemplified the great law, elaborated by Herbert Spencer, of the continuous redistribution of matter and motion. Man, in his ignorance, is fond of multiplying causes; but science, as if conscious of nature's love of unity and order, is constantly demonstrating the simplicity of truth. All living bodies are so constituted, that whatever disturbs the normal equilibrium of the redistribution of matter and motion is the cause of disease, the disease being the perturbation caused by the disturbed equilibrium.

The profession have, for a long time, tacitly asserted the

belief, in many ways, that the causes of disease are much more suttle than text-books have described. Some seem almost to have reached the conclusion here adopted, that disease is a disturbance in the normal equilibrium of the forces existing in the organism. Dr. Gillette, of Philadelphia, in a report upon the "relations which electricity sustains to the causes of disease," strenuously advocates the doctrine, that almost all diseases are satisfactorily accounted for by electric disturbances in the atmosphere. Mr. Craig, of England, is a zealous advocate of similar views. The relations of temperature have been, and are still, being studied with intense interest; showing that among the thoughtful men of the profession, a feeling has existed for a long time, that caloric sustains an important relation to disease. It has not been studied in the direction that we could have wished, but, nevertheless, some important items may be gleaned from observations already made. The thermometer only tells us the relative amount of sensible heat evolved in the organism, but does not tell us anything about that which may remain in the system, destroying chemical affinity, by driving atom from atom. This can only be determined by studying the other physical forces in connection with temperature. This, then, is our ideal method of studying disease. Everything taken into the system is in relation to it, either a plus or a minus force.

The following conclusions seem to be warranted by recent scientific research, namely: that motion, chemical affinity, heat, light, electricity, magnetism, and nerve force are convertible, each into the other, both qualitatively and quantitatively; that large quantities of these forces surround every form of matter; that these forces are particularly subject to change, in their relative proportions, especially when existing in relation to that form of matter known as gaseous; that these forces, as they exist in the body, are evolved during the processes of respiration, digestion, and assimilation; and that they sustain a certain quantitative and qualitative relation to each other, which relation cannot be disturbed without more or less disastrous effects being produced in the organism; that the relations sustained to each other are qualitatively the same in living as in organic bodies;

that the stability of the relations differ much in different organisms, and, also, in the different stages of their development and growth; and, finally, that no system of etiology which does not recognize the influence of the so-called physical forces, singly and combined, in the production of disease, is worthy of serious attention. Motion, where we can trace its genesis, we find to preëxist as some other mode of force. All our voluntary acts are preceded by certain sensations of muscular tension. The force accumulated in a body by downward motion is just equal to the force expended in its elevation; conversely arrested motion produces, under different circumstances, heat, light, electricity, magnetism, and chemical force; and, lastly, motion may be reproduced by the forces which have emenated from motion. Chemical force, or affinity, in its manifestations, exhibits some remarkable and well-ascertained phenomena. It is always accompanied by the production, or by the annihilation, of heat. A given amount of chemical action will absorb or evolve a certain definite amount of heat. Chemical action and heat are mutually convertible. The same quantity of heat evolved during a certain chemical action will be required, in order to reverse it. As has already been stated, chemical force is but a mode of motion. Now, it happens that bodies may possess so much chemical force or motion, that chemical affinity between them is impossible, or they may possess too little motion for chemical action. When metalic mercury is heated, nearly to the boiling point, and in that state exposed for a lengthened period to the air it oxidizes, if it then be raised to a still higher temperature, the oxide is decomposed. Paladium oxidizes superficially, at a red heat; but if the temperature rises to whiteness, the oxide is reduced and oxygen is set free. The vapor of water is decomposed by white hot platinum.

Chemists do not satisfactorily explain these phenomena, yet it seems to us that the explanation follows as a natural sequence to the phenomena themselves, and is in accordance with the fact previously stated, that too much or too little motion in a body prevents chemical affinity. Pathologists do not appear to have noted these facts, or, if having noted them, have failed to make any record of them.

A certain class of chemical phenomena known as catalytic, or action by presence, seems to be in accordance with the same law. For instance, we may have a mixture of two gases, in which no chemical action will take place, if kept in the dark, or, at all events, very slowly; but if exposed to the light, or if a current of electricity be passed through them, they will unite instantly. The introduction of a piece of spongy platinum into a mixture of oxygen and hydrogen gases causes chemical action, in a few minutes; the platinum becomes, at the same time, intensely heated. In the former instance, a certain amount of motion was necessary, in order to raise the motion in the gases, to the point of chemical affinity. In the latter case, the platinum acted as a conductor of motion, thus reducing the motion in the gases to the required degree. Death from lightning appears to be produced in harmony with the same law. Thus an immense amount of motion accumulating, for the time being, in and about the body, prevents chemical action.

Two varieties of sunstroke are described by authors. They may be thus described: — In one, the direct rays of the sun upon the head induces cerebral congestion; in the other variety, excessive heat, often not under the immediate influence of the sun, effects the whole system with prostration, apparently from a blood change; the chemical operations of the economy being modified by heat, in a manner incompatible with the vitality of the blood. Both are similar in cause, and differ only in degree. They are explainable by the chemical law previously stated, which holds good for all chemical action, whether it be in the body or out. The excessive amount of heat in the body prevents chemical changes. In the first variety, the heat induces violent chemical action, indeed, the very highest that can be produced. In the second variety, the heat has reached the point where it begins to prevent chemical affinity. Arctic explorers meet death, frequently, in a manner directly the reverse of this. The temperature of the frozen regions of the north being very low, heat is absorbed into the atmosphere with great rapidity. All the motion in the body is absorbed into the atmosphere in the form of heat. Intellection and muscular

action are interfered with, and, finally, they cease altogether. The individual sinks quietly down in the snow, desires to be let alone; neither threats, persuasions, the entreaties of friends, or a knowledge of his situation have any influence over him. This phenomena is also explainable by our general law of too much or too little motion checking chemical action. Animals exhale carbonic dioxide, and, at the same time, evolve heat. Plants inhale carbonic dioxide and exhale oxygen, with the absorption of heat. The motion evolved in the formation of carbonic dioxide, in the body, is expended in the production of all those activities for which animals are noted. In the plant, an equivalent amount of motion must be absorbed, in order that chemical action may ensue, and carbonic acid be decomposed. To accomplish this, a certain amount of motion is obtained from the sun; and, in this manner, plants become storehouses of motion, and it is through them that animals indirectly obtain life from the sun.

In regard to the amount of motion contained in them, plants and animals hold an intermediate relation between the inorganic elements, composing the earth on which we live, and that great ocean of active, restless, uneasy matter called atmosphere, which is about and above us. The sun is the source from whence all these ceaseless activities arise. It is at once the fountain of life and the source of death. The temperature of the human body varies, in health, but slightly, from 98 degrees, while the atmosphere varies in a range of nearly 200. For health, the temperature of the atmosphere should be from 20 to 30 degrees below that of the body, thus permitting ready radiation of the evolved heat.

The fluctuations in temperature, observed to occur in many diseases, are due, probably, to retarded chemical changes, thus: when the heat accumulated in the body has reached a certain point, chemical change is diminished, until, by radiation, the temperature is reduced, when the same phenomena recurs. By recognizing this fact, we may pretty certainly predict much concerning our patients.

Epidemic cholera furnishes another striking illustration of the

manner in which disease may be produced, by the sudden obstruction of some one of the physical forces from the system. This fact has been noted by observers, both in England and on the Continent. The force whose equilibrium is disturbed in this disease is electricity. In a communication to the French Academy, M. Andrand, who had charge of a very powerful electric machine, writes:—"I have remarked that since the invasion of cholera, I have not been able to produce, on any occasion, the same effect. Before its occurrence, in ordinary weather, after one or two turns of the wheel, brilliant sparks, of five or six centimeters in length, were given out. During the months of April and May, the sparks were obtained with difficulty, and their variations accorded very nearly with the variations of the cholera. During the days of the 4th, 5th, and 6th of June, it was impossible to obtain anything but slight cracklings, without sparks. On the 7th of June, the machine remained quite dumb. This new decrease of the electric fluid perfectly accords with the renewed violence of the cholera, as is only too well known. For my own part, I was more alarmed than astonished; my conviction was complete. At last, on the morning of the 8th, some feeble sparks reappeared, and from that hour the intensity decreased. Towards evening, a storm announced at Paris that the electricity had reëntered to its domain: to my mind it was the cholera that disappeared with the cause that produced it." In some experiments in England, during the epidemic of 1849, it was found that a magnet which ordinarily carried two pounds and ten ounces, would, when the atmospheric indications were at their worst—the air being saturated with moisture—sustain only one pound and ten ounces; the degree of its attraction varying with, and being in inverse proportion to, the violence of the disease. These phenomena are all readily explained by the general law previously enunciated, and is what we should, *a priori*, have been led to expect. In this case, the avenue through which motion made its escape was the electric. Those cases of cholera which occur without any violent evacuant symptoms show the different

chemical affinity, which may be brought about in the body, by the abstraction of motion, in the form of electricity.

The matter composing the animal economy is subject to the same laws as that of the inorganic world; hence we should expect that all those circumstances which exercise a perturbing influence upon chemical action, outside of the body, should have a disturbing influence upon those taking place in the body. It should be our first object in studying disease, after this method, first, to study chemical change and its disturbing influences, in inorganic matter, then to apply the same principles to living organisms; recollecting that they owe their differences, not to different forces acting in their production, but to the matter out of which they are made.

ARTICLE XV.

TABES MESENTERICA, WITH CASES.

By F. K. BAILEY, M.D., Knoxville, Tenn.

Nov. 9th, 1867. An Irish woman brought her child (male), about one year old, to my office, when I found its history as follows:—At times during the previous summer it had diarrhœa, attended with vomiting, which was without doubt true cholera infantum. Emaciation was extreme, and the skin hung in folds upon the face and limbs. The eyes were sunken, the surface of a bluish hue, and the expression extremely haggard. The abdomen was enormously enlarged, with a knotty feel to the surface. There was a hardness over the liver, and dulness in the whole right side of the abdomen.

The stools were frequent, milky, and very offensive. Diagnosis—enlargement of the mesenteric glands, with engorgement of the liver. Prognosis very unfavorable.

Prescribed as follows:—

℞. Liquor Iod. Ferri, ---------- ℥ij.
Syr. Sarsa. Compos.,---------- ℥ss.
Sulph. Cinchoniæ,---------- grs. viij.

Syr. Simplices, ---------- ℥j.
Aquas Cinnamomi,---------- ℥ss.

M. Liq. Two-third teaspoonful four times daily. Diet—beef soup and milk.

16th. The woman called, when I found the child some better, but the stools rather more frequent and copious. Directed a continuation of the mixture, and for the diarrhœa, as follows:

℞. Syr. Rhei Aromat., ---------- ℥j.
Tr. Kino, ---------- ℥ij.
Tr. Opii Camph.,---------- ℥iij.

M. Liq. 30 drops two or three times daily.

Nov. 28th. Again called. Marked improvement. Less distension of the abdomen and some gain in flesh. The enlargement in the hepatic region still obvious. Directed the following:

℞. Liq. Iod. Ferri,---------- ℥iij.
Sul. Cinchoniæ, ---------- grs. viij.
Iod. Potassii, ---------- ℈ij.
Syr. Simp., ---------- ℥iss.
Aquæ Puræ,---------- ℥ss.

M. Liq. Two-third teaspoonful three times daily, externally, to the hepatic region.

℞. Iod. Potassii,---------- ℥ss.
Tr. Opii,---------- ℥ij.
Oleii Olivæ, ---------- ℥j.

From this time the child improved slowly. The distension subsided very much, but the knotty feel was perceptible for some months.

In September, 1868, I was called to see the child, and found it suffering from diarrhœa and vomiting, considerably emaciated, and with tumidity of the abdomen, but no knottiness over the mesentery. Gave iod. iron, with sul. quinine; pulv. Doveri at night, and improvement was immediate. Saw no more of the child till June 10th, 1869, when I was called, and found it laboring under cholera infantum. Although the child had grown somewhat since last fall, still he was small and weak, and could walk with difficulty, Tonic alteratives and opiates soon checked the excessive action of the bowels, and in a few day after, no diarrhœa remained.

July 22d. Another relapse of diarrhœa, with extreme exhaustion. There was abdominal fulness, or evident glandular enlargement. Prescribed iod. iron, with sul. quinine, and opiates, *pro re nata*, and convalescence was soon apparent.

January 1st, 1870. There has been no return of diarrhœa since last summer, and the little fellow is becoming a fat, stout boy, and able to do justice to a square meal, of an Irish mother's cooking.

March 8th, 1869. Called to see a little girl three years old, child of unmixed African parents. Found the little creature sitting upon a low chair, a perfect picture of abject wretchedness. She had been sick a long time from diarrhœa, which nothing had seemed to control in the least. The face and head looked like a skeleton upon which some black leather had been stretched. The voice was feeble and sepulchral. The abdomen was enormously distended, and the lower limbs looked, as they hung from the edge of the chair, like two pieces of tarred rope dangling from the lower side of a blackened sphere.

I could give no encouragement in the way of cure, but prescribed iod. iron, with iod. potassii and sulph. cinchoniæ. I saw the child occasionally during the month, and, on the 30th, saw there was some gain in strength, both in limb and voice. During the summer, the little patient was kept upon iron and the preparations of cinchoniæ. The diarrhœa was difficult of control; but nothing, except tonics, was of any avail.

Some time in August, the child died. A week or more before death, the distension subsided in the abdomen, when there was brought to view and feeling a large lump, or cluster, of a nodulated character, in the front parietes, which, doubtless, were the enlarged mesenteric glands. There was no *post mortem* examination.

July 18th, 1869. Called to see a child, 18 months old, of African parents, which had had summer complaint for some weeks. The abdomen was but slightly distended, and the lumpy feel was very apparent. Discharges, milky and frequent; great thirst, and very rapid circulation. Prescribed as follows:—

℞. Liquor Iod. Iron, ---------- ℥ij.
Iod. Potassii, ---------- ℥ss.
Sulph. Quinine, ---------- grs. x.
Syr. Simp., ---------- ℥iij.

M. Liq. Three-fourth teaspoonful four times daily. In a few weeks, this child was well; but occasional relapses of diarrhœa occurred.

Besides the above, I have seen two or three cases in which ordinary summer complaint was accompanied by an incipient enlargement of the mesentery; but by appropriate and prompt tonic alterative medication, the progress was suspended.

I do not think that there was any strumous diathesis in either parents of the children, whose cases are above mentioned.

Since writing the above, I saw the first mentioned patient, while incidentally in the neighborhood.

Growth has been slow, and the abdomen is considerably distended. The fulness is probably a result of deficient tone in the muscular walls of the intestines, and not from glandular enlargement; because nutrition seems to be good, and the child has a good share of adipose and muscle.

March 22d, 1870.

The Clinic.

NOTES FROM THE WARDS OF MERCY HOSPITAL.

By C. W. EARLE, M.D., House Physician.

During the past three months, several cases of more than usual interest have been admitted into the hospital. The notes on the operations, and the treatment of these cases, may be interesting to those remote from hospital advantages.

Case — Bradley D. Saltor, aged 36, by occupation a tinner, admitted December 20th, 1869.

History.—About a month previous to admission, while engaged in building a dome at Carlinsville, Ill., he fell with the

scaffolding. Was treated near his home till admission to the hospital.

Upon examination, a prominence was fouud in the dorsal region of the spine, total paralysis below this projection, urine and faces passing involuntarily, with occasional priapism.

He also had a very large and deep ulcer on the sacrum, and bed sores on his back and upper part of thighs. Appetite very poor.

Diagnosis.—Fracture of vertebræ.

Treatment.—An air bed was obtained for him as soon as possible, and, to improve the appetite, he was given tinct. cinchona and arom. sulph. acid. The large ulcer on sacrum and the bed sores were washed with tepid water, slightly carbolized, and dressed with cotton batting, saturated with oleum ricini and carbolic acid (10–1). Opiates were given at night as required.

Present Condition, April 1st, 1870. Paralysis continues, urine and faces are still passed involuntarily. Ulcer on sacrum entirely filled with new flesh and almost closed. All the bed sores that he had on admission are healed, and the integument is protected with adhesive plaster.

Notwithstanding our efforts to prevent any new bed sores, we have not been able to keep the heels from sloughing to some extent. They are prevented from coming in contact with any of the bedding, and various devices are resorted to, in order to keep them from getting worse. His bowels have been relieved from time to time of the retained matter, by injections, and his urine, which at times has been heavily loaded with the phosphate, causing very severe pain in the bladder, has been drawn with the catheter when necessary. Occasionally he has suffered great pain in the vicinity of the kidneys and the epigastrium, with very severe headache. When any periodicity in fever or chills have been noticed, he has had quinine, and the general internal treatment has been according to the indications. The patient has thus been kept along for nearly five months, without the supervention of death. Erichson, in his surgery, says, that these fractures, with displacement, are always fatal. Primarily and immediate from the injury, secondarily and remote, (1) as

the result of changes in the body, dependent on continued loss of innervation; (2) from inflammatory action, spreading up the membranes, and in the cord itself, giving rise to effusion, etc.

From death by the injury, at the time it was received, he was spared; and the length of time that we shall be able to prolong his life, by alleviating his sufferings and combating complications, the future history of the case will decide.

CASE —. Mrs. M. N., aged 40, residence in city, admitted January 20th.

History.—Four days previous to admission, this woman fell down a flight of stairs, injuring herself severely. Her injuries were dressed by two surgeons of the city, who visited her regularly, while she remained at her home.

Examination.—When first seen, her elbow and forearm were enveloped in a large sling, but the hand protruding, it was noticed to be black and cold. She was partially delirious, and may have been somewhat under the influence of opiates, as she seemed to suffer very little pain. I immediately removed all the dressings, and, now, the very severe nature of the injuries were apparent.

Diagnosis.—Comminuted fracture of the lower third of both radius and ulna, with a very large wound involving the elbow-joint. The exact nature of this wound, the depressed condition of the patient rendered it impracticable to fully determine. It is not my province to criticise; but I wish to give the manner in which these injuries were dressed, and let each reader of the EXAMINER draw his own conclusion. The wound at the elbow was closed with sutures, and the end of a ligature displayed itself, showing that some artery had been ligated. The comminuted fracture was dressed by placing a roller bandage next the integument, which, in the swollen condition of the arm, cut off completely what little circulation of blood there may have been. Over this bandage, two splints, seven inches in length, were placed; and with another bandage, and the large sling mentioned before, the dressing was complete. The husband of the patient informs me that swelling commenced immediately, and that the pain was intense. The surgeons (?) were entreated to

either take off the dressing or relieve the pain, in some way. These gentlemen informed the patient and her friends that everything was "all right;" and, in this condition, she was admitted to the hospital.

To attempt to save the arm was not now to be considered, and all our efforts were directed in rallying the powers of the patient, and supporting the system, in order to amputate where the line of demarkation should indicate. Prof. Andrews saw her often, and all the care and attention was given that was possible. Opiates were prescribed to quiet her pain, warm fomentation to help the circulation was made, a generous diet and stimulants were given — all the indications were met promptly, but to no avail.

January 22. Delirium traumaticum ensued, which was controlled by anæsthetics; stimulants continued.

January 23. Pulse growing weaker. Died at 3 o'clock P.M.

In January, three cases with aneurism were admitted, an unusual number to have at one time in our hospital.

One died from rupture of sac; the second, after an operation, and the third has been discharged, somewhat benefited. I subjoin the notes on the several cases.

Case —. Pat. Quinn, aged 28, farmer, admitted January 24th.

History.—Last summer, while engaged in work that required lifting, he noticed a quick, sharp pain in his left side, followed by some soreness and pain. He was treated for rheumatism for some time; but, after some weeks, noticing a little pulsating, he came to Chicago for treatment, and was admitted to the hospital.

Immediately on being received, he was placed on the following treatment:—

℞. Iodidi Potass, ---------- ℥iij.
Simp. Syrup, } āā, ---------- ℥ij.
Aqua, }

M. Sig. Teaspoonful every four hours. Opiates to relieve pain, and a diet that he relished.

A day or two following his admission, Prof. Davis delivered

a very valuable clinic at his bedside, giving us the differential diagnosis between it and all diseases with which it might be confounded. This lecture was fully reported by Dr. S. A. McWilliams; and there remains for me to communicate, simply the notes on the case, till his death.

January 28th. At 10 o'clock to-day, the patient grew suddenly pale, was seized with very severe pain in abdomen, experienced great difficulty in breathing, extremities were cold, and no pulse could be detected at the wrist. It was supposed by the House Staff that the sac had burst, and that the patient would die immediately, yet nothing was left undone, and, under the use of the proper remedies, he slowly rallied.

During the next 48 hours, his pulse came up, and, with the use of opiates, he was kept quite comfortable. Prof. Davis now saw the patient, and expressed the opinion that the sac of the aneurism had ruptured, but the contents, instead of passing directly into the peritoneal cavity and causing death, had followed down behind that membrane; the artery being one of those so situated that this could take place.

January 31st. Discolored spots were seen along the left side, especially near the crest of the ilium—probably the blood from the aneurismal sac, infiltrating through the tissues. *10 o'clock P.M.* Is having great pain, growing pale, pulse very weak and fluttering. Died at midnight. No autopsy permitted.

Case —. Dennis Quill, aged 50, laborer, admitted January 26th.

History.—Three months ago, while at work in the Stock Yards, near this city, he noticed a small swelling just below Poupart's ligament, on the right leg. Was treated with iodide potass; but the tumor gradually increasing, he is now admitted to hospital for an operation. Placed on tinct. iron for four days previous to operation, and until day of surgical clinic.

January 31st. Prof. Andrews operated, in presence of the students of the Chicago Medical College.

Operation.—A full anodyne having been given, the ether was administered. To insure complete and perfect anæsthesia, as the Prof. required this in such a difficult operation, a very

little chloroform was given. An incision was made, about four inches in length, one inch above, and parallel with Poupart's ligament.

The integument and all the different fasciæ were taken up and skilfully divided, the epigastric artery carefully avoided, and the peritoneum disclosed. This membrane was gently pushed aside, and the artery could be seen in the bottom of the wound. A large vein could easily be seen passing obliquely over the artery, which was also avoided. A ligature was now placed around the artery, and the aneurismal tumor collapsed.

The wound was closed by suture and adhesive straps, and the patient put to bed. To assist in the establishment of the collateral circulation, he was placed on his left side, to avoid pressure of the vessels on the right. He was ordered tinct. iron, gtt. xx; quinine, grs. iv; four times a day; and as he was accustomed to the use of alcoholic drink, it was thought advisable to continue stimulants in small quantities. His pulse remained good, and he rallied well from the operation.

Evening of 31st. Gave morph. to ease pain and produce sleep. Pulse 94, temperature of leg 96° F.

February 1st, morning. Pulse 100, temperature of leg 96°. No pain or symptoms of any inflammation.

Noon. Pulse 112, respiration 28, temperature in axilla 103½°, temperature of leg 98°. Collateral circulation apparently well established. *Evening.* Pulse 108, temperature in axilla 101°, leg warm, no pain. Everything looked favorable.

February 2d. Patient died at 2.30 this morning. No autopsy permitted.

Remarks.—We can never know the exact cause of this man's death. He certainly did not die from the effects of the operation, or from peritonitis, for he rallied well from the first; and although at the last he had a little tympanitis, yet not at all dangerous, as his pulse and temperature both indicate. There are some indications, after his death, that pointed to internal hemorrhage. Large quantities of sanious matter and blood were discharged from the mouth and nostrils; and it is highly probable that the same condition of the arteries, which per-

mitted the formation of the aneurism below Poupart's ligament, had given rise to another aneurism, hidden from view, which ruptured and caused his death.

CASE —. Pat. Nash, aged 35, laborer, admitted Jan. 19th.

History.—The patient that now claims our consideration had always been very healthy, till about three years ago, when he had an attack of rheumatism, the acute form lasting him some eight months. A short time after this, he had a kind of paralysis, but was cured by Dr. Davis. In the autumn of 1859, he felt better than for years previous, and went to Michigan, where he worked for one month digging a canal, and exposed to all the inclemency of the weather. He came home sick, and was treated, as he says, for rheumatic fever, liver complaint, and dyspepsia. Four weeks before he came to hospital, he noticed a pulsating tumor just above the umbilicus; and calling the attention of his medical attendant to the fact, was advised "*to buy a dollar's worth of leeches, and apply.*" The full notes on this case, from the time of his admission until his discharge, March 19th, would be tedious; and it will be sufficient for me to say, that for the first two weeks, he took iodide potass, grs. vi, every three hours, and, from that time, 20 grs., three times a day. He was supplied with anodynes, and given other remedies, *pro re nata.* During the course of treatment, his aneurism certainly did not enlarge, and it was thought by those entirely competent to judge, that it was somewhat reduced in size. It will at least encourage us in the use of iod. potass, in such cases.

This case was very important to us, as regards diagnosis. The chief symptoms of an abdominal aneurism are pain, either constant or paroxysmal, an impulse to the head, as it is placed over it, with or without a swelling, and a blowing sound or thrill, communicated by auscultation. There are several affections with which we are liable to confound an abdominal aneurism; but, by careful study, we may diagnose the malady quite certainly. In rheumatism, neuralgia, colic, and disease of the spine, we have pain referred to this region, but there is an entire absence of physical signs. A simple pulsation may also take

place in the abdominal region, not due to aneurism, as in hysteria, pregnancy, or from heart disease. The history of the case, in hysteria, with absence of tumor and peculiar thrill, would be sufficient to exclude it, while the signs of pregnancy, both presumptive and positive, would show us that condition. A pulsation from disease of the heart would be detected by examination of the thorax, with the stethoscope, and the usual signs of organic mischief. A tumor, the result of an enlargement of any of the internal viscera, as the left lobe of the liver, cancer of stomach, disease of pancreas, etc., etc., may encroach on the aorta and cause a pulsation. The history of the case, percussion, and a close analysis of all the symptoms will, as a general thing, give us the correct diagnosis.

SERVICE OF PROF. N. S. DAVIS.

Reported by S. A. McWILLIAMS, M.D.

February 10th, 1870.—CASE I.—A boy, aged 10 years, laboring under an attack of rubeola. As the case was at the stage of full development of the cutaneous eruption, the class were required to examine it minutely, with an explanation of the differences between it and the eruption of scarlatina, on the one hand, and small-pox, on the other. It was remarked, that the disease was of a specific character, having its definite period of premonitory fever, of eruption, and convalescence; and when uncomplicated by other diseases, seldom required the active interference of medicine. The patient should neither be stimulated with hot drinks, to force out the eruption, nor catharticised or depleted in any way, under the vain hope of relieving the fever. The first only adds to the discomfort of the patient and increases the danger of bronchial and pneumonic complications; and the latter retards the appearance of the eruption, unnecessarily debilitates the patient, and often induces diarrhœa or dysentery, in the latter stages of the disease.

Patients laboring under rubeola should be kept quiet, in a comfortable temperature, reasonably well ventilated, and allowed simple, light nourishment and cooling drinks.

If the cough is very harsh and there is much soreness in the chest, an anodyne and expectorant mixture, consisting of—

℞. Comp. Syrup, Squills, ---------- ℥iss.
Camph. Tinct. Opii, ---------- ℥iss.

mixed, may be given, in doses of one teaspoonful to adults, every three or four hours. The severer class of cases will also be benefited by a powder of six or eight grains Dover's powder, and one of calomel, each night, during the first three days, and and followed by a laxative, as soon as the eruption is fairly established on the skin. If, in the progress of the disease, it becomes complicated with either broncho-pneumonia, diarrhœa, or dysentery, these affections must be treated with their appropriate remedies.

NEPHRITIS, OR ACUTE BRIGHT'S DISEASE.

Case II.—G. H., aged 22, was admitted into the hospital after the acute symptoms had passed. His body is universally dropsical; the whole surface blanched and tumefied. The countenance is pale and puffy, with a heavy, stupid expression. While he sits up, his feet and ankles are more swollen, if he lies down, his face and eyelids swell. His water is nearly one-third albumen, scanty, and of high specific gravity. Dropsy is not a disease, but only a symptom, in this case, of inflammation of the kidneys. As the albumen escapes, it leaves the blood less viscid and more watery. The blood corpuscles diminish in number as the disease proceeds. Exosmosis now readily takes place, and the watery element obeys the laws of gravitation, and seeks the most dependent portions. Much benefit is frequently derived, in this stage, from a dr., four times daily, of the following:—

℞. Fl. Ex. Scutellaria,---------- ℥iij.
Acetate Potass, ---------- ℥iv.
Tinct. Digitalis,---------- ℥j.

If stomach is irritable and appetite poor, benefit may be derived from—

℞. Subnitrate Bismuth, ---------- gr. v.
Lupuline,---------- gr. iss.,

every six hours.

In the latter stages, the ferruginous preparations are found to improve the tone of the capillaries. When the kidneys do not secrete urine, for want of sufficient activity of the vaso-motor nervous system, and the bowels are bloated with gas, from the same cause, small doses of nitric acid and strychnine frequently produce very beneficial effects, both by increasing the urinary secretion and the action of the muscular coat of the bowels. The warm bath, two or three times per week, is also a material aid in determining to the skin and relieving the kidneys.

TYPHOID DYSENTERY.

February 17th. Prof. N. S. Davis called the attention of the class to a middle-aged lady, admitted to the hospital recently. She had complained of great pain in the right side, accompanied by nausea. The pain was in that locality where the liver, gall-bladder, and colon touch each other, so that it might be referred to either, or to rheumatism of the muscles covering them. There was no enlargement of the above structure, as there was no evidence that the patient ever had rheumatism, in any part of the body. To subdue what was supposed to be a local inflammation, the following was prescribed every four hours:—

℞. Sulph. Morph, ---------- gr. ½
Hydrg. Chlor. Mitis, ---------- gr. ij.

After four powders, the bowels were found to be frequently opened. The discharges were bloody serum, with very little fœcal matter. The abdominal pains were severe, the tongue coated and brown, the skin congested, indicating feeble capillary circulation, and the stomach was still irritable. She was directed a powder of tannate of quinine, two grains, and sulphate of morph., one-quarter of a grain, every four hours, and a teaspoonful of an emulsion of oil of turpentine and tincture of opium between. Beef-tea and milk porridge for nourishment. During the succeeding 24 hours, the pain abated, but the intestinal discharges continued frequent, and of the same dark, bloody serum, with a cool skin, and feeble, quick pulse. The turpentine and laudanum emulsion was continued, with the

addition of eight drops of chloroform to each dose; but instead of the powders of tannate of quinine and morphine, she took a teaspoonful of the following, just as often:—

℞. Strychnine, ---------- 1 gr.
Nitric Acid, ---------- ℥j.
Simple Syrup, ---------- ℥j.
Water, ---------- ℥ij.

Mix, and take in sweetened water.

She was also directed to have an enema of acetate of lead, 10 grains; tinct. opii, ℥ss; and cold water, ℥ij, after every second evacuation of the bowels. Under this treatment, her symptoms began to improve. The intestinal discharges were less frequent and without blood; the pulse more full and less frequent; the extremities warmer, and the skin better color. She retained the emulsion, and chloroform, and nourishment, in small quantities, but complained much of the strychnine solution which was discontinued. At the present time, the skin generally is cool, but the capillary circulation good; pulse 100 per minute, and weak; abdomen not tympanitic; tongue and mouth moist, and bowels quiet. The symptoms of the patient were represented as indicating the commencement of convalescence, but accompanied by great feebleness, with decided impairment of the texture of the mucous membrane, of the lower half of the intestinal canal. The leading objects of treatment now should be to reëstablish digestion and nutrition, and to allay the sensitiveness of the mucous membrane, until it had more fully recovered the integrity of its texture. To accomplish these objects, the Lecturer advised the continuance of a porridge of sweet milk and wheat flour, in small quantities, for nourishment, and a powder of sub. nitrate of bismuth, 6 grs, and sulph. morph, $\frac{1}{6}$ gr., every 4 hours. And if there occurred any nausea, to allay it by teaspoonful doses of the following:—

℞. Aromat. Spirits Ammon, ---------- ℥iij.
Tinct. Opii *et* Camph., ---------- ℥j.
Simple Syrup, ---------- ℥j.
Aqua, ---------- ℥j.

Mix.

P.S.—Several weeks have elapsed since the above was written, and we learn that this patient continued to improve daily, until she was discharged well.

EXTRACT FROM FOREIGN CORRESPONDENCE—THE OLD UNIVERSITY OF BOLOGNA.

VENICE, *Feb. 20th, 1870.*

DEAR FATHER:—I left Florence on Thursday last, coming on as far as Bologna, where I stopped over a few hours, in order to visit the *old* and once celebrated University of Bologna; an institution which numbered at one time 4000 students and 300 professors; its medical school, especially, being for a long time the most celebrated in Europe. It was here that the first human body was dissected and the first anatomical preparations made. The museum is still one of the most complete and extensive in the world, both in human and comparative anatomy.

The library comprises some 15,000 volumes; among them some very valuable manuscripts. The celebrated linguist Mezzofanty, who is said to have spoken fluently 42 different languages.

It is a curious fact, in connection with this university, that several of the most important chairs—those of History, Natural Philosophy, Literature, and even Anatomy, have, at different times, been filled by *ladies*. A wax figure of the lady Anatomist was pointed out to me, in the museum, bending over the table with scalpel in hand, as natural as life, and surrounded on either hand by her own preparations. Another young lady, the daughter of one of the Professors, lectured on history, and is said to have been so beautiful that she was obliged to lecture with a curtain before her face, in order that the attention of the students should not be distracted from the subject of her discourse.

The university is still honorably maintained, there being some 400 students in attendance, I was told. There is quite an extensive hospital in connection with the medical school, where

regular clinical instruction is given. I had intended to remain over long enough to attend some of the lectures and clinics, but the weather was very cold and unpleasant, the hotel uncomfortable—no carpets on the floors, and no means of warming any of the rooms—so that I did not think it prudent to remain long, but hastened on here, in hopes of finding pleasanter weather. It is no better here, however—cold, damp, and uncomfortable.

F. H. D.

Correspondence.

A REMARKABLE FALL.

MOUNT CARROLL, ILL., *March 27, 1870.*

A Miss A. B., age 13, while sliding on the snow, February 5, accidentally ran over a perpendicular precipice of 54 feet (measured), alighting on the ice of the mill-dam below. The sled was broken. She was soon found and taken home, soon recovering sensibility; no bones were broken.

I was called in consultation with Dr. Etter and Dr. Miller, on the following day. There was some soreness in the gluteal regions and about the pelvis; the bladder was paralized, so as to require the use of the catheter three times. Temperature 101°. She made a complete recovery in two weeks. Had she been in the same condition from a fall of six feet, the friends would have seen no cause for alarm.

HENRY SHIMER.

RELAPSING FEVER IN EDINBURGH.—This fever has at last broken out in Edinburgh, in two different localities, without, we believe, any contagious influence being traceable in either case. The history of this outbreak, carefully recorded, as we hope it shall be, must form one of the most interesting episodes in the modern history of fever, as well as a not unimportant contribution to the vexed question of change of type.—*Edinburgh Med. Journal, March, 1870.*

Selections.

OXYGEN GAS AS A REMEDY IN DISEASE.

By ANDREW H. SMITH, M.D., New York.

CHAPTER I.

HISTORY.—The therapeutical history of oxygen dates almost from the moment of the discovery of gas. A few months after he had succeeded in demonstrating oxygen as a separate principle, Priestley discovered its relation to animal life. He found that a mouse, confined in a limited quantity of this gas, lived, at least, twice as long as in a like quantity of common air. This fact led him at once to the suggestion, that this agent might be usefully employed, in cases of disease, in which there was deficient vitality. At the same time, the effect of plunging a burning body into oxygen, inspired him with a misgiving that oxygen could not be inhaled to any considerable extent, without danger of exciting excessive action in the system; that the patient would "*live too fast*"—a phrase which, down to the present day, never fails to rise to the lips of the practitioner, to whom this therapeutic measure is suggested for the first time. Thus early were the possible remedial uses of this agent foreseen, and, at the same time, an erroneous idea advanced, which has maintained its hold upon the professional mind, and prevented much good which might otherwise have been attained.

During the 15 or 20 years following the discovery of Priestley, attention was directed more to the physiological and chemical relations of oxygen than to its use as a remedy. The part played by it in the animal economy was made the subject of investigation by Spallanzani, Fontana, Barthollet, Lavoisier, and others. To Lavoisier belongs the credit of first demonstrating the composition of the atmosphere and the changes produced in the blood by respiration. Following in his footsteps, Spallanzani showed that the consumption of oxygen was in direct ratio to the muscular activity of the animal. For instance, he found that the chrysalis consumed an exceedingly small amount, the caterpillar a much larger proportion, while the active *imago* demanded a very large quantity for its support.

These researches led to the grand discovery, that the new element was the only one, a constant supply of which was nec-

essary for the continuance of life. Food and drink could be withheld for days; even the nitrogen of the atmosphere could be excluded for hours, and yet no serious injury would result. But the animal *began to die* from the instant the supply of oxygen was cut off. No other element stood in this relation to life. No wonder, then, that it was called *vital* air, and that its discovery was thought to have begun a new era for humanity.

The first case in which oxygen was actually employed as a remedy was one reported by Caillens, in 1783. I can find only a reference to this case, which was published in the *Gazette de Sante.* But, in the year following, Jurine, of Geneva, published an essay, in which he cites, at some length, a case of phthisis in a young lady, which was very much benefited by daily inhalations of oxygen. In 1789, Chaptal, of Montpellier, reported two cases of phthisis, in one of which the gas produced great relief, while its use was continued, but in the other the effect was not beneficial.

At about this period the French Government desired an expression of opinion from the academy, upon the value of oxygen as a remedy, and Fourcroy was selected to prepare a report. In this report, and in other works which followed, he resigned himself to a current of speculation, which drifted him far away from the truth. He saw the effect of oxygen in the action of every remedy, even in muriatic acid, the composition of which was not then known. He claims to have employed oxygen in a considerable number of cases of phthisis, and to have noted a rapid improvement for two or three weeks, after which a violent inflammatory action was set up, and the progress of the disease was greatly accelerated.* But his subsequent experiments on animals, in which he describes a state of fever occurring, which eventuated in gangrene of the lungs, led to the suspicion that the gas which he employed contained some irritating impurity, which the imperfect chemistry of the day did not enable him to discover. He became, nevertheless, the founder of a school which interpreted all therapeutical effects by the supposed relation of the agent employed to the oxygen of the system. But it was not until Beddoes began his observations that any valuable practical results were obtained.

In 1789, Beddoes published his book, entitled "Considerations on the Factitious Airs." He was at that time Professor of Chemistry at Oxford, but none the less devoted to the practice of medicine, in which he had already attained a high posi-

*Annales Chimie, 1789.

tion. To him belongs the credit of being the first to approach the subject, without a theory to sustain. It was not until he had accumulated a large number of facts, that he attempted to arrange and classify them. His attempts at generalization were not always attended with the happiest results; but the readiness with which he relinquishes a theory the moment it is found to conflict with fact, gives a rare impression of candor and impartiality to his work. The scope of the work includes observations upon several gases besides oxygen, especially carbonic acid and hydrogen.

His physiological experiments are of great interest. The principal results which he arrived at were the following:—

Oxygen produces a remarkable power of resisting asphyxia. It appears that when the blood contains an unusual amount of oxygen, the animal is better able to support a deficiency of respirable air, or even the presence of an irrespirable gas.

Animals which have respired oxygen resist longer the action of frigorific mixtures.

The action of oxygen seems to be localized principally in the muscular system.

Oxygen is in the highest degree a stimulus to the irritability of the heart and bloodvessels.

The last conclusion is one which succeeding observers will scarcely indorse to the fullest extent. As a stimulant to the circulation, oxygen is certainly far inferior to alcohol; indeed, in many cases, its stimulating effect is scarcely perceptible.

A few isolated cases of success, in the therapeutic use of different gases, encouraged Beddoes to set on foot the project of a Pneumatic Institute, in which this mode of treatment could be tested on an extensive scale. The plan enlisted the co-operation of Sir H. Davy, who gave himself with ardor to the chemical part of the work, and of the eminent engineer James Watt, whose genius left nothing to be desired in the mechanical appliances for administering the gas. Probably a more brilliant triumvirate was never combined in the furtherance of a scientific object.

In pursuance of their plan, a building was erected by public subscriptions. It contained small compartments, the atmosphere of which could be charged with any desired gas. In these rooms, the patients were allowed to pass a certain time daily.

The principal results obtained by the use of oxygen are summed up in the following table, from a review of Beddoes's work, which was published in the *British Library:*

CASES TREATED.	CURED.	RELIEVED.	NOT BENEFITED.
Obstinate Ulcers	2	2	--
Leprosy (?)	5	--	--
Spasms	3	2	--
Gutta Serena	--	2	3
Chlorosis	5	2	--
Epilepsy	1	--	5
Asthma	10	9	3
Cancer	--	3	--
Dropsy of the Chest	2	1	1
Hypochondria	--	1	--
Dyspepsia	3	1	--
Dropsy	2	1	1
Hydrocephalus	--	1	--
Headache	2	2	--
Poisoning by Opium	1	--	--
Paralysis	2	1	1
Scrofulous Tumors	2	1	--
Deafness	1	--	--
White Swelling	1	--	--
Scorbutus	1	--	--
Venereal	1	--	--
Melancholy	1	1	--
General Debility	1	--	--
Continued Fever	1	--	--
Intermittent Fever	1	--	--
Coldness of Extremities	1	--	--
Total	49	30	14

It will be observed that no cases of phthisis are included in this table. The explanation of this is to be found in the peculiar views entertained by Beddoes, as to the relation of oxygen to this disease. Accepting, without question the reports of Fourcroy, as to the ultimate acceleration of the disease by oxygen, he framed the theory that in phthisis there was a change, either in the constitution of the blood or in the substance of the lung, that favored the absorption of oxygen, which was therefore already present in excess. For this reason he considered oxygen as absolutely contra-indicated.

In scorbutus, on the contrary, he supposed that there was a deficiency of oxygen in the system, which he thought should be supplied by artificial means.

The labors of Beddoes did much towards establishing the true position of oxygen as a therapeutic agent. They demonstrated, on the one hand, that the ideas at first entertained as to its curative power were extravagant; and, on the other, that it was an agent capable of producing good effects,

in many cases not reached by ordinary means. The number and variety of diseases, in which the treatment was found beneficial, suggest, at first sight, a certain air of charlatanism, but subsequent observers have corroborated nearly all his statements. Nor, when we consider the physiological relations of oxygen, is it more surprising that its use should be applicable to a large range of cases than that modification of diet should be beneficial in so many diverse diseases.

It is very remarkable that results as satisfactory as those obtained by Beddoes should not have led to a more general adoption of the treatment. But, with the exception of Hill and Thornton, who were contemporaries rather than successors of Beddoes, scarcely any British physician seems to have become interested in the matter, and it was allowed to die out with its original promoters. This was, doubtless, largely due to the difficulties which then beset the production of the gas, and its transportation to the bedside of the patient. Chemical manipulations were then but little understood, and chemical apparatus was very imperfect. Caoutchouc was unknown; and this simple fact alone would have made that very difficult which is now extremely easy. Indeed, when we consider the part which this substance now plays in the manipulation of the gases, it is not too much to say that its introduction was a necessary preliminary to their general use as remedies.

While Beddoes was carrying on his observations in England, the therapeutic use of oxygen was exciting no little attention in Germany. Numerous experiments and observations were made, during the decade preceding the opening of the present century. Prominent among them were those of Girtanner, who, following in the footsteps of Fourcroy, gave arsenic dissolved in nitric acid for a large range of complaints, under the impression that the solution imparted oxygen to the system. He was charmed with the effects of *oxygen*, given in this way, in *intermittent fever*. In the midst of similar speculations and theories, which seem to have taken the place, for the most part, of observations on the practical use of the gas itself, it is not surprising that little real progress was made in determining the true value of the latter.

At Geneva, however, the use of oxygen fell into more practical hands. The results obtained by Jurine served to encourage others. Odier, then a prominent physician at Geneva, took up the new treatment with great zeal, and the *Society for the Advancement of the Arts and Sciences* caused the founding of an institution similar to that of Beddoes. But, as in the

former case, this was short-lived; and with its decline the whole subject of the medicinal use of oxygen sank into oblivion. The frightful epidemic of cholera in Europe, in 1832, brought it again into momentary notice, but, as it failed to answer the expectations of those who employed it, it relapsed into its former obscurity.

It is only within the last fifteen years that any serious attempt has been made to bring this agent again into use. Dr. Riadore, it is true, published some observations upon its use, in 1845, recommending it in cases of indigestion, debilitated conditions of the liver and kidneys, nervous affections, asthma, etc. But his cases were not numerous or striking, and failed to arouse the attention of the profession.

In 1857, appeared the first edition of a work on Oxygen, by Dr. S. B. Birch, of London. I have not been able to procure a copy of this edition, and the second, issued in 1868, seems nearly a new work. The writer claims to have presided at the *renaissance* of oxygen, and takes to himself the credit of having instigated all that has been done in the past few years to place its use on a solid foundation. His book consists of a selection of cases, preceded by some general remarks upon the properties and uses of oxygen, its *modus operandi, etc.* His ideas with regard to what he styles the *quasi-nascent* condition of oxygen are very peculiar, and are not borne out by the experience of others. Moreover, his style is singularly obscure, and his book lamentably lacking in practical directions for the administration of the remedy. While constantly insisting upon the necessity of *judiciously* selecting cases for treatment, of *judiciously* administering the gas, and of the *judicious* use of adjuvants, etc., he does not give a single practical rule for determining what is judicious in the premises. The cases which he publishes are very striking, one might almost say marvellous; and the impression which the work, as a whole, is calculated to make upon the reader is, that in the hands of the author, oxygen is almost a panacea, while, at the same time, it would be hopeless for the general practitioner to attempt to grapple with a treatment so intricate, and demanding such peculiar skill.

In sharp contrast with this work is the article on Oxygen, in Demarquay's *Essai de Pneumatologie Medicale*, published in Paris, in 1866. A little too diffuse, perhaps, it is still plain, simple, and to the point. The author tells his story as of one who has studied the literature of the subject, made some experiments himself, and treated quite a number of cases by the use of oxygen, sometimes successfully, sometimes not. With refer-

ence to its use in some diseases, while giving the experience and opinions of others, he states frankly that he has had no experience himself, and does not feel competent to judge of its merits. While it appears to me that some of his experiments on the physiological effects of the gas are defective, yet, others are novel and extremely valuable. His article is marked by perfect candor and frankness throughout, and is by far the best treatise upon the subject extant.

Dr. Hermann Beigel, in his work on Inhalation, published in London, in 1866, presents a few considerations upon the use of oxygen, and cites a number of cases from his practice, in which he has used it with more or less benefit. He invented an apparatus for the production of the gas, according to Fleitmann's process, from the chloride of lime. His treatment of the subject is candid and unpartizan, and his conclusions demand respect.

A new era in the history of oxygen is being inaugurated by the invention of Téssie du Môtay, by means of which the gas can be produced in immense quantities from the atmosphere, and at an insignificant cost. Its possible future, in relation to medicine and hygiene, can as yet be only dimly discerned. When we shall be able to regulate the proportion of oxygen in the atmosphere of the sick-room, as easily as we now regulate the temperature; when closely packed and ill-ventilated tenements can be supplied with this element, the free enjoyment of which is necessary to health; when by its use the contamination of the atmosphere, by the furnaces of factories and machine shops, shall be prevented or counteracted, who can tell what will be the sum-total of the result? Yet all this seems now attainable, whenever the public shall become sufficiently awake to its importance.

CHAPTER II.

Modes of Preparation and Administration.—In the preparation of oxygen for medical use, *purity* is, of course, of the very first importance. Undoubtedly, many of the effects formerly attributed to oxygen, such as the production of bronchial irritation or inflammation, and even of pneumonitis, were owing to impurities in the gas employed.

The first substance from which oxygen was isolated was the peroxide of mercury, and in all the earlier experiments, the gas employed was obtained from this source. It was not long, however, before cases of ptyalism occurring, warned experimenters of the danger of using the oxides of mercury for this purpose.

Chaptal showed, by carefully conducted experiments, that oxygen so prepared contained an appreciable quantity of the metal. The peroxide of manganese was then substituted, and, finally, chlorate of potash.

Recently, quite a number of processes have been added to the list, so that it now embraces a large range of procedures, by which oxygen may be obtained with more or less facility. I will touch briefly upon the more prominent of these, only one having been found by experience to be really adapted to the use of the physician:—

1. Decomposition of binoxide of manganese. This is accomplished by heating the oxide to a red heat in an iron retort, or by treating it with sulphuric acid. In the first case, a high heat is required, and in the second the acid is disagreeable and dangerous in general practice. Moreover, the gas contains four or five per cent. of nitrogen, from the impurities usually contained in the manganese. If commercial acid is used, it also imparts its impurities to the gas, and among them usually a certain proportion of arsenic. These considerations have led to the complete abandonment of this method in practice.

2. The decomposition of sulphuric acid, or sulphate of zinc. This process depends upon the decomposition of sulphuric acid by heat into oxygen and sulphurous acid, or that of sulphate of zinc into oxygen, sulphurous acid, and oxide of zinc. It is probable that oxygen could be produced in large quantities, in this manner, at a very small cost, so that it would be available for industrial purposes; but, for the use of the physician, the complexity and cost of the apparatus required render it an undesirable method.

3. Process of boussingault. This consists in procuring oxygen from baryta, in utilizing the property which the latter possesses of fixing the oxygen of the air at an elevated temperature, and giving it off again when the temperature is raised still higher. It is difficult to manage, however, and the results are not satisfactory. The apparatus, also, is bulky and expensive.

4. Reaction of sulphuric acid upon bichromate of potash. This reaction results in the production of oxygen and chrome alum. About 16 per cent. of oxygen is yielded by the bichromate. This yield is too small to render the method desirable, aside from the objections belonging to every process, which requires a powerful acid to be placed in unskilled hands.

5. Decomposition of chloride of lime by cobalt. The oxide or any of the salts of cobalt have the property of inducing a

species of catalytic action between chlorine and lime, from which free oxygen and chloride of calcium result. An extremely minute quantity of cobalt only is required. If a stream of chlorine gas is passed into warm milk of lime, containing a little of a salt of cobalt, in solution, the chlorine is absorbed, and oxygen is given off; and, at the close of the process, chloride of calcium will have taken the place of the lime. This method of procuring oxygen is known as Fleitmann's process. Now, by using chloride of lime, we have the chlorine and the lime united in one substance; and, by merely adding the cobalt, and pouring on a little hot water, the process is greatly simplified. The gas, however, contains considerable chlorine, and the yield is small in proportion to the quantity of material employed. This process is the one recommended by Dr. Beigel, for prepairing oxygen for medical use; and his recommendation is sustained by Birch, who, however, prefers compressed oxygen, when it can be obtained. I have given the method a trial, but, in my hands, the quantity of gas was so small, and the quality so inferior, that I abandoned its use. However, as the cost is very slight, it might be used with advantage in office practice, where a large stationary apparatus could be employed, and where arrangements could be made for washing the gas through an alkaline solution to remove the chlorine. But, for use at the bedside, an apparatus, small enough to be portable, would not yield the gas in sufficient quantities.

It remains to consider the method of obtaining oxygen by the decomposition of chlorate of potash. This substance having the formula $KO, ClO^5 = KCl + O^6$, is broken up by heat into oxygen and chloride of potassium.

By mixing with the chlorate a little peroxide of manganese, the disengagement of the oxygen proceeds with greater rapidity and requires much less heat. It is usual to invoke the action of catalysis to explain this, but it seems to me to be owing simply to the facility with which the manganese conducts the heat and diffuses it through the whole mass. Chlorate of potash alone is an exceedingly bad conductor of heat, as is also chloride of potassium. Hence the action of slight degrees of heat is confined to that part only of the mass exposed, which is in contact with the retort. But the manganese, being a heavy metallic substance, transmits the heat readily from particle to particle of the salt. Any other substance having an equal conducting power will do as well, provided it will not combine with oxygen. I have succeeded admirably with the

black oxide of copper. Sand may be used, but with less advantage, as it is comparatively a poor conductor. It is generally stated that this process yields perfectly pure oxygen gas. This, however, is not the case if the evolution is at all rapid, as the gas will then be slightly contaminated with chlorine. There is also another impurity, not noticed in any work on chemistry which I have seen. Pure oxygen, as is well known, is invisible, yet the product from chlorate of potash has usually more or less of a smoky appearance, when first evolved. If the gas be allowed to stand for half an hour, or an hour, it will lose this appearance, while the glass vessel in which it is contained will be seen to have a deposit on its inner surface. Under the microscope this deposit is found to consist of minute crystalline particles. If enough of these be collected to respond to chemical tests, they will be found to be chlorate of potash. It would seem, then, that a small portion of the chlorate, instead of being decomposed by the heat, is sublimed unchanged; and such is its insolubility that it is not separated from the gas, except by repeated washings. Not the least harm results, however, from inhaling it, as I have demonstrated repeatedly in my own person.

The quantity of gas procured by this process is very great, amounting in round numbers to 500 cubic inches, for each ounce of the chlorate of potash, or 39 per cent. by weight. The quantity yielded renders this method peculiarly adapted for use in the sick-room, where portability of apparatus and material is much to be desired. Until recently, I have employed a copper flask in which to heat the materials. But I found inconvenience to result from this form of container, inasmuch as the entire quantity of the chlorate was heated at once, resulting in a tumultuous and often unmanageable evolution of the gas. To obviate this difficulty, I have had constructed the apparatus figured in the annexed cut. It consists essentially of a brass retort, in the form of a cylinder, nine inches long and one and a-quarter inches in diameter, resembling in shape a very large test-tube. To the open extremity of this retort is fitted a cover of cast iron, held in place by a clamp, which catches upon a projecting flange surrounding the mouth of the retort. This clamp is tightened by means of a screw. Passing through the cover is the tube carrying the gas into the wash-bottle, and which is arranged at a right angle to the retort. The latter is, therefore, in a horizontal position, and is supported by its connection with the wash-bottle, which in its turn is firmly fastened to a board, forming the base of the whole apparatus. The

tube before referred to passes to the bottom of the wash-bottle, and has, near its lower extremity, a great number of very small holes, through which the gas escapes in fine bubbles. This is important, as it insures a much more perfect washing of the gas. Another tube, merely passing through the cap of the wash-bottle, provides for the passage of the gas into the bag, from which it is inhaled.

The retort is but half filled with the mixture of chlorate of potash and peroxide of manganese, and this quantity is distributed along its whole length, to within an inch of the cover, thus leaving nearly one-half of the diameter of the retort free for the passage of the gas. The heat of a Bunsen burner or of a powerful spirit-lamp is employed, beginning first at the closed extremity of the retort, and moving it along as the material becomes exhausted. The wash-bottle is half filled with a solution of caustic potash.

The advantage of this apparatus is, that only a small portion of the material is heated at a time, and the rapidity of evolution is under perfect control. By having two retorts, and using them alternately, a continuous supply may be kept up, sufficient for any emergency. The whole apparatus, including the bag, may be easily packed in a box ten inches square, and five inches deep, and a supply of gas may be generated in 15 minutes, at the house of the patient.

In using black oxide of manganese in connection with chlorate of potash, it is important that it should be free from protoxide, and from any combustible substance. Neglect of this precaution may lead to an explosion.

The process of Téssie du Môtay is as follows:—Manganate of soda is exposed to a very high heat in iron retorts, and while in that condition, a current of atmospheric air is passed over it. This results in the absorption by the salt, of a large portion of the oxygen which the air contains. The current of air is then shut off, and a current of superheated steam substituted. The steam withdraws from the manganate of soda the added quantity of oxygen, and carries it with it to a condenser, from which the oxygen passes in a pure state into the gasometer. The salt is then subjected to the action of a second portion of air, followed again by a current of steam, and thus the process goes on indefinitely. The manganate of soda retains its activity, and loses nothing in weight, so that the only consumption is that of fuel.

For use in the sick-room, the gas may be compressed into cylinders of copper or iron, and thus rendered conveniently portable.

In localities sufficiently near to a factory, this is destined to supersede all other methods of supplying oxygen for medical purposes. The gas is perfectly pure, and the quantity which can be compressed into even a small cylinder is sufficient to meet the requirements of any case likely to occur.

The method of administration of oxygen is very simple. The gas, being in a bag or in a gasometer, is conveyed to the mouth or nostrils of the patient, by means of a flexible tube, terminating in a mouth-piece of glass, hard rubber, or ivory. This being taken into the mouth, or held to one nostril, the patient breathes the oxygen, mingled with a greater or less proportion of common air, one or both nostrils being free for the admission of the latter. The proportion of gas is regulated by the size of the orifice through which it escapes. During *expiration*, the rubber tube is compressed between the thumb and index-finger. When the patient is not able to do this for himself, it may be done by an attendant, who, by watching the movements of the chest, soon catches their rhythm. I prefer this plan to the use of an inhaler, with a complicated system of valves, which always offers an impediment to respiration.

The quantity given will vary from one to two gallons daily, which is sufficient, in some chronic cases, to 80 or 100 gallons, which may be required in urgent dyspnœa. In chronic cases it should be given from a very small orifice, so that the inhalation of four or five gallons will occupy 15 to 30 minutes. Feeble patients should take it in the recumbent position.

The inhalations may be repeated morning and evening, or less frequently, as the case may demand. Some very striking results have followed, when the interval was as great as three days. On the other hand, when respiration is very much obstructed, it may be necessary to give the gas almost constantly, and but little diluted.

Knowing the capacity of the bag employed, and bearing in mind that an adult usually respires from eight to ten pints of air per minute, it is easy to judge approximately of the quantity of oxygen which is being inhaled.

The plan of surcharging the atmosphere of a room with oxygen, and allowing the patient to remain in it for a certain period, has this disadvantage, that, to retain the oxygen, ventilation must be sacrificed. If the room be so large as to do away with this objection, the quantity of oxygen required will be greater than can generally be supplied. These considerations have led to the abandonment of this mode of administration.

Dr. Birch lays great stress upon the gas being given in what he calls a "*quasi-nascent*" condition; that is, he thinks it should be inhaled at once as rapidly as it is generated, or, if not, that it should be kept under pressure until wanted for use. It is enough to say that he brings forward no facts to sustain the alleged advantage of this plan, and that, moreover, others who have not followed it have obtained equally good results.

CHAPTER III.

PHYSIOLOGICAL ACTION OF OXYGEN.—In regard to the physiological action of oxygen, the first question to be determined is, whether it is possible to cause the blood to take up more oxygen than it receives from the atmospheric air; whether the point of saturation is not attained in ordinary respiration. On this point, there was formerly but one opinion. It was thought that there was practically no limit to the power of the blood to absorb oxygen. This idea was no doubt in part based upon the known energy of combustion in pure oxygen gas, and the supposed identity of that process with the retrograde metamorphosis of animal tissue. It was held that the inhalation of pure oxygen would induce rapid chemical action within the body, that a state of general inflammation would ensue, and that destructive metamorphosis would be so much more active than the process of reconstruction, that the vital machinery would soon be spoiled and rendered incapable of continuing its action.

But, after a time, it was observed that these extreme results did not actually take place, that an animal could remain for a number of hours in pure oxygen, without sustaining any apparent injury. This led certain observers to the conclusion that the blood-corpuscle became saturated with oxygen, when common air was breathed, and that it would take up no more, no matter how much was presented to it in the air-cells of the lungs. This view was defended by Regnault and Reiset, who endeavored to sustain it by the following experiment:—They confined animals in oxygen, and after a time examined the gas, and found that it contained no more carbonic acid than would have been exhaled in the same time if the animals had respired atmospheric air. That these experiments were not conclusive, will become apparent as we proceed.

On the other hand, was cited the fact that animals die in a period varying from three to eighteen hours, if confined in an atmosphere of oxygen, and that the tissues present an unusually florid aspect, approaching to a vermilion hue. These

observations I believe to be no more conclusive than the others. On this point, Demarquay says: "Science had already taught what our experiments have confirmed, that animals can live without danger in an atmosphere of pure oxygen, and for a much longer time than in the same volume of air. But beyond a certain limit, these animals at last succumb, and one may then satisfy himself that the medium in which they have respired is still capable of relighting an ignited body; a very evident proof that death has taken place from the oxygen itself, and not from any alteration which it may have undergone from admixture with the carbolic acid exhaled." *

As the test referred to above, that of relighting an extinguished taper, the extremity of the wick being still red hot, is constantly relied upon to prove the respirability of the gas after such experiments, it is well to state at the outset that it is entirely worthless. This is shown by the following experiment:

EXPERIMENT I.—Two parts of pure oxygen were mixed with one part of carbonic acid, prepared by the action of sulphuric acid upon marble. A pint jar was filled with the mixture, which sufficed to relight a taper four times.

Demarquay himself states that ten per cent. of carbonic acid, mixed with oxygen, is sufficient to render the latter incapable of sustaining life; yet we find, by this experiment, that the test which he relies upon would indicate its respirability, when containing 33 per cent.

The apparatus employed by Demarquay in his experiments, which are essentially similar to those of his predecessors, consisted of a large cylinder, furnished with two openings, through one of which the animal was introduced, while to the other a tube was fitted, connected with a reservoir of oxygen. The animal, having been placed in the cylinder, a large quantity of oxygen was introduced by the tube, the amount being sufficient to drive out the air in the apparatus, which escaped by the other opening. When it was judged that the cylinder was filled with pure or nearly pure oxygen, both apertures were closed. The animals experimented upon were common fowls, pigeons, and rabbits.

The result of these experiments was, that when the animals were allowed to remain in the apparatus for the space of an hour and three-quarters, and were then killed, nearly all the tissues of the body were found reddened to a greater or less extent, but the venous blood retained its darker hue. Two

* Essai de Pneumatologie Médicale, p. 644.

rabbits were allowed to remain until death took place, which, in one instance, was at the end of 14 hours, and in the other, after 17 hours. At the close of each experiment the gas was found to relight a taper.

These experiments coincide in their results with one of my own, in which the conditions were similar:

EXPERIMENT II.—*June* 10, 1860.—A rat was confined in a jar containing about a gallon of pure oxygen, and inverted over water. At the end of two and a-half hours death took place. On opening the body, all the internal organs were found to be of a bright-red color.

It will be observed that, in both these instances, no provision was made for removing the carbonic acid and other products of respiration, and that the gas must have become excessively impure. In the following experiments this omission was corrected:

EXPERIMENTS III., IV., and V.—*July* 15, 1869.—A pigeon and two mice were confined respectively three, four, and five hours in jars of oxygen, having a strong solution of caustic potash in the bottom, under a stage upon which the animal rested. The jar was so arranged, at the same time, that a small stream of oxygen, from a rubber bag, was constantly flowing into it, and escaping by an aperture of like size. The solution of potash absorbed the carbonic acid, while the gradual change of the atmosphere within the jar was sufficient to prevent a sensible accumulation of other impurities.

These animals, when killed, did not present any appreciable change in the appearance of the tissues.

EXPERIMENT VI.—*August* 25, 1869.—At 3 P.M., a pigeon was placed in a jar of oxygen, of the capacity of 300 cubic inches, and the jar inverted over a solution of potash. The following morning the animal was found dead. Upward of 150 cubic inches of oxygen had been converted into carbonic acid, and absorbed by the potash, the liquid rising in proportion in the jar. On opening the body, *no unusual redness of the tissues was observable.* The feathers of the bird, and also the sides of the jar, were wet with the condensed moisture of the breath. The animal was also in a constrained and uncomfortable position, which, doubtless, hastened its death.

The conclusion which I draw from these experiments is, that the lively red color of the lungs, heart, liver, etc., which are described, and which I have myself seen, does not depend upon hyperoxygenation alone, but also upon a coincident retention of carbonic acid in the tissues. The color pervades the intervascular substance as perfectly as the natural coloring-matter pervades the muscular fibre. It cannot, therefore, be ascribed to simple increase of vascularity.

The following experiments show, that in Demarquay's observations, the oxygen is as little chargeable with the death of the animals as with the change in the color of their tissues:—

EXPERIMENT VII.—*August* 13, 1869.—A mouse was confined in a jar of oxygen inverted over a solution of caustic potash. At the end of 25½ hours, during which he had neither food nor drink, he was dull and stupid, but, when released, ate greedily, and was soon as lively as ever.

EXPERIMENT VIII.—*August* 16, 1869.—A tin box, seven by ten inches, and six inches deep, open at the bottom, and having the top of glass, was placed in a shallow vessel containing a solution of potash. A little above the surface of the solution was arranged a false bottom of wire-cloth, which formed the floor of the apparatus. A circular opening on one side of the box was fitted with a projecting rim, soldered to its edge. To this rim or collar a cap was fitted, and the joint was made air-tight by an india-rubber band stretched around it. This opening was for the purpose of introducing the animal to be experimented upon. A small tube passing into the box was connected with a large reservoir of oxygen. By means of a small stop-cock, the amount of gas passing into the apparatus was so regulated, that a bubble would escape every second or two from under the edge of the box. Within the box was placed an open vessel containing chloride of calcium, to absorb the moisture from the breath, and another vessel with dilute nitric acid, to take up the ammonia exhaled. Food, water, and a quantity of tow for a bed having been provided, a mouse was introduced into the apparatus, and the aperture closed air-tight. Oxygen was then admitted freely, for some time, until all the air was expelled, when the stop-cock was closed to the point already indicated. The animal ate, drank, and arranged his bed, and acted in every particular as mice generally do, until the third day, when he buried himself in the tow, and seemed very quiet. By this time his excretions gave to the gas, which escaped from the apparatus, a very sickening smell.

At the end of four days, the mouse was removed and transferred to a cage, where he recovered at once his accustomed liveliness, and appeared no worse for his unique experience.

This single experiment is sufficient to overthrow the theory of hyperoxygenation of the blood, as the term is generally understood, and to show that the fatal results heretofore observed, as well as the peculiar *post mortem* appearances, were the result of the admixture of the products of respiration with the gas inhaled.

Are we, then, to accept the conclusion of Regnault and Reiset, that inhaling pure oxygen makes no difference with respiration? Clinical observation and facts derived from experiments teach us clearly to the contrary.

The quantity of oxygen in the blood under normal conditions is extremely variable. This follows from the varying exigences of the system. The transition from perfect repose to active exertion implies increased molecular action and increased consumption of oxygen. The blood-corpuscles are the carriers of oxygen, and, as their number remains the same, each one must

assume a greater burden. To explain all the phenomena resulting from the inhalation of oxygen, it is not necessary to assume the absorption of more than corresponds with the extreme limit of this healthy respiratory demand. All the analogies of Nature lead us to suppose that this limit coincides with the point of complete saturation of the blood. To assume a margin beyond it is to suppose a provision against an emergency which can never arise. It is contrary to the economy of Nature that the blood should have the capacity for absorbing more oxygen than Nature can supply.

My view is then, that if pure oxygen be taken into the lungs, only as much will be absorbed by the blood as would be taken up from the air under circumstances involving the greatest possible physiological demand for oxygen. I know that it has been asserted that blood agitated in a vessel with oxygen will assume a livelier red than when agitated with common air. This, however, is a mistake. The change will take place more promptly with oxygen, but the hue will be in the end the same. We may, therefore, assume, that if the blood and the air be brought into sufficiently intimate contact in the lungs, the corpuscles will become saturated with oxygen from the ordinary atmosphere.

EXPERIMENT IX.—*August* 20, 1869.—A quantity of defibrinated sheep's blood was divided into two portions. One portion was thoroughly agitated with oxygen, and quickly assumed a bright-red hue. The other was agitated in the same way with common air. The change took place more gradually, but, eventually, when the two jars were placed side by side, no difference in the color could be distinguished.

The portion agitated with air was then placed in a vessel filled with oxygen, which was closed tightly, while its interior was made to communicate with a delicate manometer. After the lapse of an hour, during which the vessel was frequently agitated, no change had taken place in the height of the fluid, in the instrument, thus indicating that no additional oxygen had been absorbed.

How, then, is this appearance of superoxygenation of the blood to be accounted for, since it never occurs when atmospheric air is respired? The conditions which obtain while breathing oxygen, without removing the products of respiration, are entirely *sui generis*. They differ from that observed when air is substituted, in that the portion of carbonic acid may become much greater without destroying life. They differ, also, from the effect produced by confining an animal in a mixture of carbonic acid and oxygen, since, in the latter case, the change is abrupt, while in the former it is very gradual. The

experiments of Count Morrozo, and of Bernard, show what an immense difference, in the effect upon the animal, results from this circumstance. I offer the suggestion, therefore, that the red stain of the tissues is the result of the prolonged action of carbonic acid retained in the blood—life, meanwhile, being kept up, and the activity of retrograde metamorphosis sustained by a *maximum absorption of oxygen.*

When a considerable quantity of pure oxygen is inhaled, there is usually a sensation of freedom about the chest, as if respiration were easier. Some persons describe a feeling of warmth beneath the sternum, such as results from inhaling a slightly-stimulating vapor. Sometimes a slight degree of vertigo is produced. Generally there is a tendency of the blood to the surface, and the hands and feet, if previously cold, become warm. In some cases, this change of the circulation is accompanied by a prickling sensation. The pulse is sometimes accelerated, but more frequently remains unchanged. In cases of debility, it is often reduced in frequency. The temperature is but little changed, if at all. I have sometimes observed a disposition to yawn constantly during the inhalation, and there is generally an inclination afterward to sleep. All these effects are more marked when the gas is inhaled fasting.

In reference to the effect of the inhalation of oxygen upon the amount of carbonic acid formed, and of urea excreted, there has been as yet but little research. The experiments of Regnault and Reiset, upon the first point, have been already referred to. The subject, however, is beset with difficulties, and much caution is required in accepting the results of experiments as to the amount of carbonic acid exaled, when breathing a greater or less proportion of oxygen. Different results will be obtained at different times, when breathing the same medium, under apparently the same conditions as to diet, stage of digestion, exercise, etc. The slightest bodily exertion, or even mental excitement, will vitiate the experiment. In experiments with animals, eructations of gas from the stomach will sometimes add largely to the per centage of carbonic acid obtained.

My experiments, on this point, have brought out an (to me) unexpected result, *viz.*, that the inhalation of a considerable quantity of oxygen is followed, within a few moments, by a temporary *decrease* in the amount of carbonic acid exhaled, as is shown in the following table:—The experiments were made upon myself.

	Hour.	Cubic inches of oxygen inhaled.	CO^2 exhaled per minute.
Experiment XI., July 29, 1869.	4.35 P.M.		21 c. in.
	4.45 "	600	
	5 "		19
	5.18 "		20
Experiment XII., August 3.	3.25 "		22
	4 "	400	
	4.10 "		16
Experiment XIII., August 5.	12.15 "		19
	12.25 "	700	
	12.30 "		16½
	12.45 "		18
Experiment XIV., August 5.	2 "		19½
	2.50 "	400	
	2.55 "		19½
Experiment XV., August 5.	2.55 "		19½
	3.15 "	1200	
	3.35 "		17½
Experiment XVI., August 12.	6 A.M. (fasting)		18
	6.15 "	500	
	6.40 "		17
	7 "		17½

Experiment XVII.—*August* 4, 1869.—A pigeon was placed in a jar containing 300 cubic inches of oxygen, and the jar inverted over a solution of caustic potash. After 20 minutes, the oxygen was removed and replaced by common air. In 30 minutes the volume of air had decreased 13 cubic inches. The following day, the same pigeon was confined again, in the same quantity of air, for the same period, not having previously inhaled oxygen. The decrease amounted to 18 cubic inches. There was no evidence that the health of the animal had been injured by the previous experiment.

The manner in which oxygen produces this effect is not easily explained. It is possible that its immediate action may be like that of alcohol, which is known to cause a diminution of the carbolic acid exhaled from the lungs. This is the more probable from the similarity of its other effects, when well marked, to those which alcohol produces.

Notwithstanding this temporary decrease of carbonic acid, I am of the opinion that the ultimate effect of oxygen is to cause its increase. The increase is probably small, and it would, doubtless, be extremely difficult to demonstrate it conclusively, under normal conditions of activity. Still, it seems to me, that the result of the following experiments could hardly be attributed to mere accident:—

Experiment XVIII.—*August* 12 *to* 24, 1869.—Three observations were taken daily of the amount of carbonic acid exhaled by myself. In all, 20 observations were made, in seven days, nearly every hour of the day being represented.

The average of these observations gave 17.2 cubic inches per minute. During the four following days, eleven similar observations were made—the conditions remaining the same, except that from six to ten gallons of oxygen were inhaled each day in divided doses. The average of these gave 18.9 cubic inches, as the amount of carbonic acid exhaled per minute.

These results, while they coincide with the generally received opinion as to increased activity in the retrograde metamorphosis, as resulting from the use of oxygen, show, nevertheless, that the increase is confined within narrow limits, and thus confirm the view already expressed, that saturation of the blood-corpuscles with oxygen is quickly attained, is a *strictly physiological condition*, and in no way necessitates the setting up of any morbid action within the system.

To test the effect of oxygen upon the amount of *urea* excreted, I made the following experiment:—

Experiment XIX.—*December 8 to 22, 1869.*—The urine for each 24 hours was carefully preserved, and the amount of urea estimated according to Haughton's second formula. The result is given in the following table:

Date.	Gallons of oxygen inhaled.	Urea in grains.
December 8	--	641
" 9	8	624
" 10	8	561
" 11	10	472
" 12	6	472
" 13	6	590
" 14	12	550
" 15	14	552
" 16	18	510
" 17	--	542
" 18	--	601
" 19	--	546
" 20	--	556
" 21	--	495

This table shows a rapid decrease in the amount of urea, during the first four days after beginning the inhalations of oxygen. It then increased again, but did not attain to the former figure. With the cessation of the oxygen, there is again an increase. The average of the days without oxygen is 563 grains; of those with oxygen, 541 grains.

So far as these experiments go, they indicate that oxygen causes a *decrease* in the amount of urea formed. This is surprising, if we are to consider urea as the result of *oxidation* of tissue, as is generally held. More extended observation is

required, before it would be warrantable to call in question the views so ably enunciated upon this point; but, should it be established, that the continued use of oxygen really diminishes the excretion of urea, it would place the latter substance in analogy with the smoke resulting from combustion, a product, it is true, of the combustion, but, at the same time, a measure of the incompleteness of the process.

The quantity of uric acid in the urine is rapidly diminished by the daily use of oxygen. This fact, suspected by Dr. Golden (*Lancet*, March 10, 1866), has been fully established by Kollmann, of Munich.

In the course of the experiments described above, I observed a very striking diminution of the coloring matter of the urine. At the commencement of the experiment, the urine was very high-colored, but, within 24 hours, it became very pale, and remained so for several days after the oxygen was discontinued. This paleness was not owing to an excess of water, as the specific gravity never fell below 1.022, and was usually above 1.025.—*New York Medical Journal.*

Book Notices.

Modern Therapeutics, a Compendium of Recent Formulæ and Specific Therapeutical Directions. By Geo. H. Napheys, A.M., M.D.; one of the Editors of the *Half-Yearly Compendium of Medical Science*, etc., etc. Philadelphia: S. W. Butler, M.D. 1870.

This is a duodecimo volume of 390 pages, published in fair style, and filled with an abundance of formulæ or prescriptions for the various ills that flesh is heir to. This book will prove a great convenience to all such members of the profession as depend on formulas, instead of a knowledge of the principles that govern the action of medicines, for guidance in the treatment of disease.

The Preventive Obstacle, or Conjugal Onanism, the Dangers and Inconveniences to the Individual, to the Family, and to Society, of Frauds in the Accomplishment of the Generative

Functions. By L. F. E. BERGERET, Physician-in-Chief to the Arbois Hospital, Genoa. Translated from the Third French Edition, by P. DEMARMON, M.D. New York: Turner & Mignard. 1870.

This is a neatly published 12mo. of 182 pages. It is largely filled with the relation of cases, not half of which appear to have any bearing on the subjects they are adduced to illustrate. It is written in a style altogether too exaggerated and sensational to merit the name of a scientific monograph.

A Practical Treatise on the Diagnosis, Pathology, and Treatment of Diseases of the Heart. By AUSTIN FLINT, M.D.; Professor of the Principles and Practice of Medicine, and of Clinical Medicine, in the Bellevue Hospital Medical College, etc. Second Edition; thoroughly Revised and Enlarged. Philadelphia: Henry C. Lea. 1870. For sale by S. C. Griggs & Co., Chicago. Pp. 550. Price $4.

The high estimation in which all the works of Dr. Flint are held by the profession, and the well-known merits of the first edition of this treatise, render any commendation of this, second edition, unnecessary. It is worthy of a place in every medical library.

The Indigestions, or Diseases of the Digestive Organs, Functionally Treated. By THOMAS KING CHAMBERS, Honorary Physician to H. R. H. the Prince of Wales; Senior Consulting Physician and Lecturer on the Practice of Medicine, at St. Mary's Hospital, etc., etc. Third American Edition, Revised. Philadelphia: Henry C. Lea. 1870. Pp. 383. Price $3.

This is a new edition of Chambers' well-known work on functional disorders of the stomach. It contains many additional cases, with such modifications in the original text as was suggested or required for their insertion. The edition is exclusively American, a third edition not yet having been called for in England. It is published in excellent style.

Editorial.

Illinois State Medical Society.—This Society holds its next regular annual meeting at Dixon, on the *third Tuesday* in May. The local profession are making arrangements to give members of the Society a very hospital reception.

We are informed by the Permanent Secretary, that he has made arrangements with the Illinois Central, the North-Western, Burlington and Quincy, Rock-Island, and Chicago, Alton, and St. Louis railroads, to carry all members of the State Society to *Dixon*, and return, for one full fare and one-fifth. All who wish to avail themselves of this arrangement should apply to the ticket agents, when they start, for excursion tickets to Dixon and return.

Chicago Medical Society.—At the annual meeting of this Society, held during the first week in April, delegates were appointed to attend the American Medical Association, which meets in the City of Washington, on Tuesday, the 3d day of May, and the State Medical Society, that assembles in Dixon, on the third Tuesday in May.

The following officers were chosen for the ensuing year:—

President, Dr. T. D. Fitch; *Vice-President*, F. A. Emmons; *Secretary and Treasurer*, Dr. C. C. Dumreicher.

The regular meetings of the Society are held on Monday evening of each week.

The New Mercy Hospital.—The spacious and elegant new hospital building, on the corner of Calumet Avenue and Twenty-sixth Street, is now completed, and some of its rooms already occupied by the sick. The location is one of the most pleasant and healthy in the City of Chicago, and easy of access. It is one of the best finished and best apportioned buildings for a hospital that we have ever seen. The amphitheatre is elegantly lighted, and will seat comfortably a class of 300 students. The public wards are light, cheerful, and susceptible of perfect ventilation. The small or private wards, designed

to accommodate but one or two patients, are numerous, and, in all respects, as pleasant as the rooms of a first-class hotel. It is, in the most proper sense, a general hospital, arranged into three departments, medical, surgical, and obstetrical, including diseases of women. The first is under the charge of Professors N. S. Davis and H. A. Johnson; the second under Professor E. Andrews; and the third under Professor W. H. Byford. The entire domestic or internal management is in the hands of the Sisters of Mercy. The cost of the new edifice is not far from $100,000; and we know of no more comfortable place for the sick, outside of their own families, in this country.

Chicago Medical College.—The work on the new edifice, for the accommodation of this institution, is progressing rapidly, and will be complete in every part before the opening of the next annual lecture term, on the first Monday in October.

It occupies a part of the same lot on which the new Mercy Hospital stands; and, when completed, the hospital and college together, all *professionally* under the control of the college Faculty, and subject to no interference by municipal or political influences, will constitute the most complete and comprehensive arrangement for medical instruction, in all departments, that exists in this country. It being the only college in the whole country which, up to this time, has had the boldness to adopt and put in practice, the system of progressive medical education, by requiring some preliminary education, three consecutive courses of lectures, of five or six months each, with close examinations at the close of each, and full hospital clinical instruction, as an essential part of the middle and senior courses, we deem its prosperity a matter of gratification to the whole profession. The class at present in attendance on the summer reading and clinical course is an excellent one, and everything looks fair in the future.

New Medical Journal.—We cheerfully call the attention of our readers to the following prospectus of the *National Medical Journal:*—

In presenting another candidate for public favor, in the form of a medical journal, the publishers are not insensible to the large number of valuable periodicals already claiming a share of professional patronage. The field of labor, however, is broad, and much of practical utility may be gleaned in the path of more experienced reapers. Medicine, in all its departments, was never more prolific of great practical results than at present; the medical mind never more vigorous and prehensile in the pursuit of truth.

There appears to be a peculiar appropriateness in locating a first-class medical journal in Washington City, not only on account of its central position, and the various important interests clustering in and around it, but because it embraces a good share of professional ability, needing only the stimulus to medico-literary effort, which a judicious, liberal, and well-conducted periodical affords.

While the principal object of the journal will be to originate and collate useful information in the various branches of medical and surgical science, it is not intended to ignore those prominent *specialties* which have enlisted the zeal and skill of not a few able and enlightened American practitioners. These cannot much longer occupy a subordinate place in the academies and journals of the country; and it is proposed, therefore, to encourage their cultivation and practice within prescribed professional limits.

The journal will be under the editorial management of C. C. Cox, M.D., LL.D., Professor of Anatomy in Georgetown Medical College, and no pains will be spared to render it useful to the medical public, whose patronage and support it seeks.

Each number will consist of not less than 128 pages, octavo, printed in distinct type, on fine paper, with good, substantial covers, and (for the present) will be published quarterly.

Terms: $3 a year, invariably in advance; single copies mailed to any address for $1.

All contributions intended for the journal, advertisements, or subscriptions should be addressed to Judd & Detweiler, Publishers, Corner of Pennsylvania Avenue and 11th St., Washington, D.C.

Mortality for the Month of March, 1870.

CAUSES OF DEATH,

Accident, machinery	2	Dropsy	3	Lungs, hemorrhage	2
" by fall	4	" of abdomen	1	Mouth canker-sore	1
" fall of coal	1	Dysentery	2	Measles	17
" fracture of skull	1	" chronic	1	" & complications	10
" thro'n fr'm bug'y	1	Ecthyma	1	Metro-peritonitis	2
" railroad	1	Encephalitis	1	Meningitis	8
Abscess, renal	1	Endo-pericarditis,		" and dysentery	2
Albuminuria	1	rheumatic,	1	" cerebro-spinal	1
Anæmia and dysentery	1	Enteritis	5	" tubercular	8
Anasarca	1	Epilepsy	3	Nephritis	1
Angina pectoris,	1	Erysipelas	5	Old age	17
Apoplexy	2	" of face	1	Ophthalmia	1
Arachnitis	1	Fever, puerperal	8	Paralysis	1
Ascitis	1	" remittent	2	Pericarditis	1
Asphyxia	2	" scarlet	32	Peritonitis	2
Asthma	3	" " complications	6	Pleurisy, chronic	1
Births, still	39	" " malignant	14	Pneumonia	39
" premature	26	" typhoid	16	" & complications	2
Bowels, hemorrhage	1	Gastritis	2	" broncho	4
" ulceration	1	Gastro-enteritis	1	" typhoid	3
Brain, abscess	1	Heart disease	3	Pyæmia	3
" congestion of	2	" and liver, fatty degeneration	1	Rheumatism, chronic	1
" compression	1	" hypertrophy	1	" inflammatory	1
" inflammation	2	" organic disease,	2	Scrofula	1
Bronchitis	12	" valvular disease	5	Stomach, cancer	3
" capillary	8	Hernia, incarcerated	1	Suicide, hanging	1
Biliary calculi	1	" strangulated	1	" poison	1
Breast, cancer	2	Hydrocephalus	3	" shooting	1
Catarrh	1	" acute	6	Tabes mesenterica,	18
Consumption	46	" chronic	1	Teething	4
Convulsions	53	Inanition	10	" & complications	3
" puerperal	2	Ichorrhæmia	1	Tetanus following compound fracture of leg	1
Croup	16	Jaundice	1	Throat, canker-sore	1
" diphtheretic	1	Kidneys, Bright's disease of	4	Toxæmia	1
" membranous	3	" disease	1	Tumor of abdomen	1
Cystitis,	1	Laryngitis	3	Uræmia	1
Cyanosis	2	Liver, abscess	2	Uterus, hemorrhage	1
Cynanche Maligna	1	" hypertrophy	1	Whooping-cough	11
Debility	4	" inflammation and peritonitis	1	" & complications	1
Diabitis	1	Lungs, congestion	4	Unknown	1
Diarrhœa	1				
" chronic	1			Total	535
Diphtheria	11				

AGES.

Under 1	173	10 to 20	21	70 to 80	18
1 to 2	67	20 to 30	42	80 to 90	6
2 to 3	42	30 to 40	36	Unknown	1
3 to 4	21	40 to 50	26		
4 to 5	16	50 to 60	17	Total,	535
5 to 10	28	60 to 70	21		

Males,	288	Females,	247	Total,	535
Single,	403	Married	132	Total,	535
White,	525	Colored,	10	Total,	535

COMPARISON.

Deaths in March, 1870,	535	Deaths in March 1869,	354	Increase,	181
Deaths in Feb., 1870,	420	Increase,	115

NATIVITY.

Bohemia	4	Germany	54	Sweden	4
Canada	4	Holland	1	Switzerland	2
Chicago, Native	92	Ireland	46	Wales	1
Chicago, Foreign	221	Norway	6	Unknown	1
U. S., other parts	82	Poland	1		
Denmark	4	Scotland,	3	Total,	535
England	9				

MORTALITY BY WARDS FOR THE MONTH.

Wards.	Mortality.		Mortality.
1	2	Accidents	10
2	15	County Hospital	12
3	22	Home for Friendless	5
4	16	Hospital Alexian Brothers	2
5	19	Half Orphan Asylum	4
6	23	Immigrants	1
7	27	Marine Hospital	1
8	42	Jewish Hospital	1
9	48	Mercy Hospital,	7
10	8	Protestant Orphan Asylum	2
11	27	St. Joseph Orphan Asylum,	5
12	19	Soldiers' Home	2
13	11	Suicides	3
14	15	St. Louis and Chicago R.R. Dépôt	1
15	32		
16	25	Total,	535
17	36		
18	43		
19	17		
20	22		

THE SALE OF "BITTERS."—The consumption of various stomach bitters is one of the most common, insidious, and perilous forms of tippling. Many a man and many a woman have learned indulgence from this cause. We are glad to see that the Supreme Judicial Court of Massachusetts has recently made an important decision in a prosecution arising from the sale of a bottle of bitters, in which the defendant asserted that he has sold the liquid in good faith as a medicine. The judge trying the case, however, charged the jury that if the "bitters" was an intoxicating liquor, the sale of it in good faith as a medicine was not a valid defence, and this position was maintained by the Supreme Judicial Court. As a consequence of this decision the State Constables are seizing "bitters" under the Massachusetts law against the sale of intoxicating liquors.—*Medical and Surgical Reporter.*

NEPHROTOMY.—On Thursday, Feb. 3, the operation of cutting into the kidney for removal of renal calculus was performed by Mr. Durham at Guy's Hospital. The theatre was crowded with students and others anxious to see so rare an operation. We believe, indeed, that there is only one instance of its performance recorded, and that was by a surgeon of Venice upon an Englishman, some 150 years since. Two or three stones where then extracted, to the great relief of the patient, a urinary fistula remaining in the loin. Owing, doubtless, as much to the uncertainty of the diagnostic signs of renal calculus as to the supposed risks of the procedure, the operation fell into oblivion, until a paper read before the Medico-Chirurgical Society last year, by Mr. Thomas Smith, of St. Bartholomew's Hospital, again brought the subject before the profession. Although Mr. Durham's bold attempt ended in disappointment, we saw enough to convince us that, as far as cutting down upon the kidney is concerned, there is neither great difficulty nor any apparent grave risk in the proceeding. Mr. Durham made his incision along the edge of the erector spinæ, from the pelvis to the eleventh rib, and quickly reached the hilus of the without difficulty, and with little or no loss of blood, but no stone was found, although the symptoms previously manifested had been such as are considered characteristic of stone in the kidney. The hilus of the kidney and the ureter, for the space of an inch and a-half, were thoroughly examined, but not opened, no stone being felt and their general appearance, as well as that of the kidney, being perfectly healthy. So far from the operation having been injurious, five days later the woman expressed herself as being more free from pain than she had been for a long time! Full details of the case will be published whenever it may be considered to have terminated, whatever the termination may be.—*Medical Times & Gazette.*

PRURIGO TREATED BY OINTMENT OF IODOFORM.—Prof. Tanturri, of Naples, has used the ointment of iodoform in obstinate prurigo. This compound, first brought prominently into notice by Bouchardat, is now employed extensively not only for glandular enlargements, but also, owing to its anæsthetic properties, in skin diseases accompanied with intense pruritus; its odor is much more agreeable than that of chloroform, resembling that of safron. Moretin and Humbert recommend it for internal use as possessing all the advantages of iodine, of which it contains 90 per cent., without any of its inconveniences. It exercises upon the sphincters a local anæsthetic effect so powerful

that defecation is sometimes performed unconsciously after its use; it, therefore, forms an admirable suppository in cases of tenesmus, hæmorrhoids, etc. Moûtre's formula is—iodoform, powdered, gr. xx; cocoa butter, ʒj; melt and mix for six suppositories. For frictions, the ointment is used in the strengh of ʒj to the ounce of simple ointment.—*Med. Times & Gaz.*

CHICAGO MEDICAL COLLEGE.

The regular Annual Lecture Term in this Institution will commence on the first Monday in October, and continue until the fourth Tuesday in March following. Clinical Lectures *daily* throughout the term.

FACULTY.

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Professor of Principles and Practice of Medicine and of Clinical Medicine.

W. H. BYFORD, M.D., TREASURER OF FACULTY,
E. O. F. ROLER, M.D.,
Professors of Obstetrics and Diseases of Women and Children.

EDMUND ANDREWS, M.D., SECRETARY OF FACULTY,
Prof. of Principles and Practice of Surg'y and of Military and Clinical Surg'y.

H. A. JOHNSON, M.D.,
Professor of Diseases of Respiratory and Circulatory Organs.

C. GILBERT WHEELER, Ph. D.,
Professor of Organic Chemistry and Toxicology.

RALPH N. ISHAM, M.D.,
Professor of Surgical Anatomy and Operations of Surgery.

J. H. HOLLISTER, M.D.,
Professor of General Pathology and Pathological Anatomy.

J. S. JEWELL, M.D.,
Emeritus Professor of Anatomy.

THOMAS BEVAN, M.D.,
Professor of Hygiene.

R. J. PATTERSON, M.D.,
Professor of Medical Jurisprudence.

DANIEL T. NELSON, M.D.,
Professor of Physiology and Histology.

M. O. HEYDOCK, M.D.,
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